

AMENDATORY SECTION (Amending Order 94-07, filed 7/20/94, effective 9/20/94)

**WAC 296-24-012 Definitions applicable to all sections of this chapter.**

Note: Meaning of words. Unless the context indicates otherwise, words used in this chapter shall have the meaning given in this section.

(1) "Approved" means approved by the director of the department of labor and industries or his/her authorized representative: Provided, however, That should a provision of this chapter state that approval by an agency or organization other than the department of labor and industries is required, such as Underwriters' Laboratories or the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH), the provisions of WAC 296-24-006 shall apply.

(2) "Authorized person" means a person approved or assigned by the employer to perform a specific type of duty or duties or to be at a specific location or locations at the job site.

(3) "Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective action to eliminate them.

(4) "Department" means the department of labor and industries.

(5) "Director" means the director of the department of labor and industries, or his/her designated representative.

(6) "Employer" means any person, firm, corporation, partnership, business trust, legal representative, or other business entity which engages in any business, industry, profession, or activity in this state and employs one or more employees or who contracts with one or more persons, the essence of which is the personal labor of such person or persons and includes the state, counties, cities, and all municipal corporations, public corporations, political subdivisions of the state, and charitable organizations: Provided, That any person, partnership, or business entity not having employees, and who is covered by the industrial insurance act shall be considered both an employer and an employee.

(7) "First-aid" means, for purposes of this section, the extent of treatment that could be expected to be given by a person trained in basic first-aid, using supplies from a first-aid kit. Tests, such as x-rays, shall not be confused with treatment.

(8) "Hazard" means that condition, potential or inherent, which can cause injury, death, or occupational disease.

(9) "Hospitalization" means to be sent to; to go to; or be admitted to a hospital or an equivalent medical facility and receive medical treatment beyond that which would be considered as first-aid treatment, regardless of the length of stay in the hospital or medical facility.

(10) "Qualified" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

(11) "Safety factor" means the ratio of the ultimate breaking strength of a member or piece of material or equipment to the actual working stress or safe load when in use.

(12) "Safety and health standard" means a standard which requires the adoption or use of one or more practices, means, methods, operations, or processes reasonably necessary or appropriate to provide safe or healthful employment and places of employment.

(13) "Shall" means mandatory.

(14) "Should" means recommended.

(15) "Standard safeguard" means a device designed and constructed with the object of removing the hazard of accident incidental to the machine, appliance, tool, building, or equipment to which it is attached.

Standard safeguards shall be constructed of either metal or wood or other suitable material or a combination of these. The final determination of the sufficiency of any safeguard rests with the director of the department of labor and industries.

(16) "Suitable" means that which fits, or has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstance.

(17) "Working day" means a calendar day, except Saturdays, Sundays, and legal holidays as set forth in RCW 1.16.050, as now or hereafter amended, and for the purposes of the computation of time within which an act is to be done under the provisions of this chapter, shall be computed by excluding the first working day and including the last working day.

(18) "Worker," "personnel," "person," "employee," and other terms of like meaning, unless the context of the provision containing such term indicates otherwise, mean an employee of an employer who is employed in the business of his/her employer whether by way of manual labor or otherwise and every person in this state who is engaged in the employment of or who is working under an independent contract the essence of which is his/her personal labor for an employer whether by manual labor or otherwise.

(19) "Work place" means any plant, yard, premises, room, or other place where an employee or employees are employed for the performance of labor or service over which the employer has the right of access or control, and includes, but is not limited to, all work places covered by industrial insurance under Title 51 RCW, as now or hereafter amended.

(20) Abbreviations used in this chapter:

(a) "ANSI" means American National Standards Institute.

(b) "API" means American Petroleum Institute.

(c) "ASA" means American Standards Association.

(d) "ASAE" means American Society of Agricultural Engineers.

(e) "ASHRE" means American Society of Heating and Refrigeration Engineers.

(f) "ASME" means American Society for Mechanical Engineers.

(g) "ASTM" means American Society for Testing and Materials.

(h) "AWS" means American Welding Society.

(i) "BTU" means British thermal unit.

(j) "BTUH" means British thermal unit per hour.

(k) "CFM" means cubic feet per minute.

(l) "CFR" means Code of Federal (~~Register~~) Regulations.

(m) "CGA" means Compressed Gas Association.

(n) "CIE" means Commission Internationale de l' Eclairage.

(o) "DOT" means department of transportation.

(p) "FRP" means fiberglass reinforced plastic.

(q) "GPM" means gallons per minute.

(r) "ICC" means Interstate Commerce Commission.

(s) "ID" means inside diameter.

(t) "LPG" means liquefied petroleum gas.

(u) "MCA" means Manufacturing Chemist Association. (New name: Chemical Manufacturers Association.)

(v) "NBFU" means National Board of Fire Underwriters.

(w) "NEMA" means National Electrical Manufacturing Association.

(x) "NFPA" means National Fire Protection Association.

(y) "NTP" means normal temperature and pressure.

(z) "OD" means outside diameter.

(aa) "PSI" means pounds per square inch.

- (bb) "PSIA" means pounds per square inch atmospheric.
- (cc) "PSIG" means pounds per square inch gauge.
- (dd) "RMA" means Rubber Manufacturers Association.
- (ee) "SAE" means Society of Automotive Engineers.
- (ff) "TFI" means The Fertilizer Institute.
- (gg) "TSC" means Trailer Standard Code.
- (hh) "UL" means Underwriters' Laboratories, Inc.
- (ii) "USASI" means United States of America Standards Institute.
- (jj) "USC" means United States Code.
- (kk) "USCG" means United States Coast Guard.
- (ll) "WAC" means Washington Administrative Code.
- (mm) "WISHA" means Washington Industrial Safety and Health Act of 1973.

AMENDATORY SECTION (Amending Order 76-6, filed 3/1/76)

**WAC 296-24-14001 Scope.** (1) These specifications apply to the design, application, and use of signs or symbols (as included in WAC 296-24-14005 through 296-24-14009) intended to indicate and, insofar as possible, to define specific hazards of a nature such that failure to designate them may lead to accidental injury to workers. These specifications are intended to cover all safety signs except those designed for streets, highways, railroads, and marine regulations. These specifications do not apply to plant bulletin boards or to safety posters.

(2) All new ~~((signs))~~ and replacement~~((s of old))~~ signs ~~((after August 27, 1971 shall be in accordance with))~~ must meet the criteria contained in these specifications.

AMENDATORY SECTION (Amending WSR 00-01-176, filed 12/21/99, effective 3/1/00)

**WAC 296-24-23003 General requirements.** These requirements ~~((are applicable))~~ apply to all sections of this chapter containing ~~((the))~~ WAC 296-24-230 in the section number.

(1) This section contains safety requirements relating to fire protection design, maintenance, and use of:

- ⌘ Fork trucks,
- ⌘ Forklifts,
- ⌘ Tractors,
- ⌘ Platform lift trucks,
- ⌘ Motorized hand trucks, and
- ⌘ Other specialized industrial trucks, powered by electric motors or internal combustion engines.

This section does not apply to:

- ⌘ Compressed air or nonflammable compressed gas-operated industrial trucks,
- ⌘ Farm vehicles, and
- ⌘ Vehicles intended primarily for earth moving or over-the-road hauling.

(2) All powered industrial trucks in use by an employer must meet the ~~((applicable))~~ specified requirements of design, construction and stability as defined by the "American National Standards Institute B56.1-1969, Safety

Standards for Powered Industrial Trucks," or ASME B56.6-1992, "Safety Standard for Rough Terrain Forklift Trucks" (with Addenda), except for vehicles intended primarily for earth moving or over-the-road hauling. All new powered industrial trucks acquired and used by an employer on or after March 1, 2000, must meet the ~~((applicable))~~ specified requirements of design, construction and stability as defined in ASME B56.1-1993 or B56.6. The employer must ~~((ensure))~~ make sure that all powered industrial trucks are inspected, maintained and operated in accordance with this section and the manufacturer's ~~((recommendations and specifics))~~ specifications.

(3) Approved trucks must bear a label or some other identifying mark indicating approval by the testing laboratory as meeting the specifications and requirements of ANSI B56.1-1969.

(4) Modifications and additions which affect capacity and safe operation must not be performed without manufacturer's prior written approval. When the manufacturer has granted modification, the capacity, operation and maintenance instruction plates, tags or decals must be changed accordingly.

(5) If the truck is equipped with front-end attachment(s), including fork extensions, the employer must ensure the truck is marked to identify the attachment(s), show the approximate weight of the truck and attachment combination, and show the maximum capacity of the truck with attachment(s) at the maximum elevation with load laterally centered.

(6) The employer must see that all nameplates and markings are in place and are maintained in a legible condition.

#### AMENDATORY SECTION (Amending WSR 99-10-071, filed 5/4/99, effective 9/1/99)

**WAC 296-24-51009 Basic rules.** This section applies to all sections of this chapter which include WAC 296-24-510 in the section number unless otherwise noted.

(1) Approval of equipment and systems. Each appurtenance shall be approved in accordance with (a), (b), (c), and (d) of this subsection.

(a) It was installed before February 8, 1973 and was approved and tested, and installed in accordance with either the provisions of the American National Standard for the Storage and Handling of Anhydrous Ammonia, K61.1, or the Fertilizer Institute Standards for the Storage and Handling of Agricultural Anhydrous Ammonia, M-1, in effect at the time of installation; or

(b) It is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a nationally recognized testing laboratory; or

(c) It is a type which no nationally recognized testing laboratory does, or will undertake to accept, certify, list, label, or determine to be safe; and such equipment is inspected or tested by any federal, state, municipal, or other local authority responsible for enforcing occupational safety provisions of a federal, state, municipal or other local law, code, or regulation pertaining to the storage, handling, transport, and use of anhydrous ammonia, and found to be in compliance with either the provisions of the American National Standard for the Storage and Handling of Anhydrous Ammonia, K61.1, or the Fertilizer Institute Standards for the Storage and Handling of Agricultural Anhydrous Ammonia, M-1, in effect at the time of installation; or

(d) It is a custom-designed and custom-built unit, which no nationally recognized testing laboratory, or federal, state, municipal or local authority responsible for the enforcement of a federal, state, municipal, or

local law, code or regulation pertaining to the storage, transportation and use of anhydrous ammonia is willing to undertake to accept, certify, list, label or determine to be safe, and the employer has on file a document attesting to its safe condition following the conduct of appropriate tests. The document shall be signed by a registered professional engineer or other person having special training or experience sufficient to permit him/her to form an opinion as to safety of the unit involved. The document shall set forth the test bases, test data and results, and also the qualifications of the certifying person.

(e) For the purposes of this section the word "listed" means that equipment is of a kind mentioned in a list which is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment, and states such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner. "Labeled" means there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment, and whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner. "Certified" means it has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner, or is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and it bears a label, tag, or other record of certification.

(f) For purposes of this section, refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.

(2) Requirements for construction, original test and requalification of not-refrigerated containers.

(a) Containers used with systems covered in WAC 296-24-51011 and 296-24-51017 through 296-24-51021 shall be constructed and tested in accordance with the code except that construction under Table UW - 12 at a basic joint efficiency of under eighty percent is not authorized.

Containers built according to the code do not have to comply with paragraphs UG-125 to UG-128, inclusive, and paragraphs UG-132 and UG-133 of the code.

(b) Containers exceeding thirty-six inches in diameter or two hundred fifty gallons water capacity shall be constructed to comply with one or more of the following:

(i) Containers shall be stress relieved after fabrication in accordance with the code, or

(ii) Cold-formed heads, when used, shall be stress relieved, or

(iii) Hot-formed heads shall be used.

(c) Welding to the shell, head, or any other part of the container subject to internal pressure shall be done in compliance with WAC 296-24-51005(5). Other welding is permitted only on saddle plates, lugs, or brackets attached to the container by the container manufacturer.

(d) Containers used with systems covered by subsection (3)(b)(iv) of this section shall be constructed and tested in accordance with the DOT specifications.

(e) The provisions of (a) of this subsection shall not be construed as prohibiting the continued use or reinstallation of containers constructed and maintained in accordance with the 1949, 1950, 1952, 1956, 1959, 1962, 1965 and 1968 editions of the Unfired Pressure Vessel Code of the ASME or any revisions thereof in effect at the time of fabrication.

(3) Markings on nonrefrigerated containers and systems other than DOT containers.

(a) System nameplates, when required, shall be permanently attached to the system so as to be readily accessible for inspection and shall include markings as prescribed in (b) of this subsection.

(b) Each container or system covered in WAC 296-24-51011, 296-24-51017,

296-24-51019 and 296-24-51021 shall be marked as specified in the following:

(i) With a marking identifying compliance with the rules of the code under which the container is constructed.

(ii) With a notation on the container and system nameplate when the system is designed for underground installation.

(iii) With the name and address of the supplier of the container or the trade name of the container and with the date of fabrication.

(iv) With the water capacity of the container in pounds at 60°F or gallons, United States standard.

(v) With the design pressure in pounds per square inch gage.

(vi) With the wall thickness of the shell and heads.

(vii) With marking indicating the maximum level to which the container may be filled with liquid anhydrous ammonia at temperatures between 20°F and 100°F except on containers provided with fixed maximum level indicators, such as fixed length dip tubes, or containers that are filled by weight. Markings shall be in increments of not more than 20°F.

(viii) With the outside surface area in square feet.

(ix) With minimum temperature in Fahrenheit for which the container is designed.

(x) Marking specified on container shall be on the container itself or on a nameplate permanently affixed thereto.

(c) All main operating valves on permanently installed containers having a capacity of over three thousand water gallons shall be identified to show whether the valve is in liquid or vapor service. The recommended method of identification may be legend or color code as specified in (c)(i) and (ii) of this subsection:

(i) Legend: The legend **liquid** (or **liquid valve**), **vapor** (or **vapor valve**), as appropriate, shall be placed on or within twelve inches of the valve by means of a stencil tag, or decal.

(ii) Color code: Liquid valves shall be painted orange and vapor valves shall be painted yellow. The legend **orange-liquid**, **yellow-vapor** shall be displayed in one or more conspicuous places at each permanent storage location. The legend shall have letters at least two inches high and shall be placed against a contrasting background. This is in accordance with American National Standard A13.1 "Schemes for Identification of Piping Systems"--1956, Page 5.

(4) Marking refrigerated containers. (See WAC 296-24-51013(3). Marking refrigerated containers.)

(5) Location of containers.

(a) Consideration shall be given to the physiological effects of ammonia as well as to adjacent fire hazards in selecting the location for a storage container. Containers shall be located outside of buildings or in buildings or sections thereof especially approved for this purpose.

(b) Containers shall be located at least fifty feet from a dug well or other sources of potable water supply, unless the container is a part of a water treatment installation.

(c) The location of permanent storage containers shall be outside densely populated areas.

(d) Container locations shall comply with the following table:

Minimum Distances (feet)  
from Container to:

---

Nominal Capacity of Container	Line of Adjoining Property Which may be Built upon, Highways & Mainline of Railroad	Place of Public Assembly	Institution Occupancy
----------------------------------	---	--------------------------------	--------------------------

---

Over 500 to 2,000	25	150	250
Over 2,000 to 30,000	50	300	500
Over 30,000 to 100,000	50	450	750
Over 100,000	50	600	1,000

(e) Storage areas shall be kept free of readily ignitable materials such as waste, weeds and long dry grass.

(6) Container appurtenances.

(a) All appurtenances shall be designed for not less than the maximum working pressure of that portion of the system on which they are installed. All appurtenances shall be fabricated from materials proved suitable for anhydrous ammonia service.

(b) All connections to containers except safety relief devices, gaging devices, or those fitted with a No. 54 drill size orifice shall have shutoff valves located as close to the container as practicable.

(c) Excess flow valves where required by these standards shall close automatically at the rated flows of vapor or liquid as specified by the manufacturer. The connections and line including valves and fittings being protected by an excess flow valve shall have a greater capacity than the rated flow of the excess flow valve.

(d) Liquid level gaging devices that require bleeding of the product to the atmosphere and which are so constructed that outward flow will not exceed that passed by a No. 54 drill size opening need not be equipped with excess flow valves.

(e) Openings from container or through fittings attached directly on container to which pressure gage connections are made need not be equipped with excess flow valves if such openings are not larger than No. 54 drill size.

(f) Excess flow and back pressure check valves where required by these standards shall be located inside of the container or at a point outside as close as practicable to where the line enters the container. In the latter case, installation shall be made in such manner that any undue stress beyond the excess flow or back pressure check valve will not cause breakage between the container and the valve.

(g) Excess flow valves shall be designed with a bypass, not to exceed a No. 60 drill size opening to allow equalization of pressures.

(h) Shutoff valves provided with an excess flow valve shall be designed for proper installation in a container connection so that the excess flow valve will close should the shutoff valve break.

(i) All excess flow valves shall be plainly and permanently marked with the name or trademark of the manufacturer, the catalog number, and the rated capacity.

(7) Piping, tubing and fittings.

(a) All piping, tubing and fittings shall be made of material suitable for anhydrous ammonia service.

(b) All piping, tubing and fittings shall be designed for a pressure not less than the maximum pressure to which they may be subjected in service.

(c) All piping shall be well supported and provision shall be made for expansion and contraction. All refrigeration system piping shall conform to the Refrigeration Piping Code (ANSI B31.5 1966 addenda B31.1a-1968), a section of the American Standard Code for Pressure Piping, as it applies to ammonia.

(d) Piping used on nonrefrigerated systems shall be at least ASTM A-53-1969 Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal. Such pipe shall be at least Schedule 40 when joints are welded, or welded and flanged. Such pipe shall be at least Schedule 80 when joints are

threaded. Brass, copper, or galvanized steel pipe or tubing shall not be used.

(e) All metal flexible connections for permanent installations shall have a minimum working pressure of 250 p.s.i.g. (safety factor of 4). For temporary installations, hose meeting the requirement of subsection (8) of this section may be used.

(f) Cast iron fittings (~~shall not be used but this shall not prohibit the use of fittings made specially for ammonia service of malleable or nodular iron such as Specification ASTM A47 or ASTM A395~~) must not be used, but this does not prohibit the use of fittings made specifically for ammonia service, made of malleable, nodular, or high-strength gray iron, meeting American Society for Testing and Materials (ASTM) A47-68, ASTM 395-68, or ASTM A126-66 Class B or C.

(g) Provisions shall be made for expansion, contraction, jarring, vibration, and for settling.

(h) Adequate provisions shall be made to protect all exposed piping from physical damage that might result from moving machinery, the presence of automobiles or trucks, or any other undue strain that may be placed upon the piping.

(i) Joint compounds shall be resistant to ammonia.

(j) After assembly, all piping and tubing shall be tested and proved to be free from leaks at a pressure not less than the normal operating pressure of the system.

(8) Hose specification.

(a) Hose used in ammonia service and subject to container pressure shall conform to the joint Rubber Manufacturers Association and the Fertilizer Institute "Hose Specifications for Anhydrous Ammonia" (see Appendix B).

(b) Hose subject to container pressure shall be designed for a minimum working pressure of 350 p.s.i.g. and a minimum burst pressure of 1750 p.s.i.g. Hose assemblies, when made up, shall be capable of withstanding a test pressure of 500 p.s.i.g.

(c) Hose and hose connections located on the low pressure side of flow control or pressure reducing valves on devices discharging to atmospheric pressure shall be designed for the maximum low side working pressure. All connections shall be designed, constructed, and installed so that there will be no leakage when connected.

(d) Where liquid transfer hose is not drained of liquid upon completion of transfer operations, such hose shall be equipped with an approved shutoff valve at the discharge end. Provision shall be made to prevent excessive hydrostatic pressure in the hose. (See subsection (9)(j) of this section.)

(e) On all hose one-half inch O.D. and larger, used for the transfer of anhydrous ammonia liquid or vapor, there shall be etched, cast, or impressed at five-foot intervals the following information:

"Anhydrous Ammonia"  
xxx p.s.i.g. (Maximum working pressure)  
Manufacturer's Name or Trademark  
Year of Manufacture

(9) Safety relief devices.

(a) Every container used in systems covered by WAC 296-24-51011, 296-24-51017, 296-24-51019 and 296-24-51021 shall be provided with one or more safety relief valves of the spring-loaded or equivalent type. The discharge from safety relief valves shall be vented away from the container, upward and unobstructed to the atmosphere. All safety relief valve discharge openings shall have suitable raincaps that will allow free discharge of the vapor and prevent the entrance of water. Provision shall be made for draining condensate which may accumulate. The rate of the discharge shall be in accordance with the provisions of Appendix A.

(b) Container safety relief valves shall be set to start-to-discharge as follows, with relations to the design pressure of the container.

Containers	Minimum	Maximum *
ASME U-68, U-69	110%	125%
ASME U-200, U-201	95%	100%
ASME 1952, 1956, 1959, 1962, 1965, 1968 or 1971	95%	100%
API-ASME	95%	100%
U.S. Coast Guard  (As required by USCG regulations)		
DOT (As required by DOT regulations)		

\*Note: A relief valve manufacturer's tolerance of plus ten percent is permitted.

(c) Safety relief devices used in systems covered by WAC 296-24-51011, 296-24-51017, 296-24-51019 and 296-24-51021 shall be constructed to discharge at not less than the rates required in (a) of this subsection before the pressure is in excess of one hundred twenty percent (not including the ten percent tolerance referred to in (b) of this subsection) of the maximum permitted start-to-discharge pressure setting of the device.

(d) Safety relief valves shall be so arranged that the possibility of tampering will be minimized. If the pressure setting adjustment is external, the relief valves shall be provided with means for sealing the adjustment.

(e) Shutoff valves shall not be installed between the safety relief valves and the containers or systems described in WAC 296-24-51011, 296-24-51017, 296-24-51019 and 296-24-51021, except that a shutoff valve may be used where the arrangement of this valve is such as always to afford required capacity flow through the relief valves.

Note: The above exception is made to cover such cases as a three-way valve installed under two safety relief valves, each of which has the required rate of discharge and is so installed as to allow either of the safety relief valves to be closed off, but does not allow both safety valves to be closed off at the same time. Another exception to this may be where two separate relief valves are installed with individual shutoff valves. In this case, the two shutoff valve stems shall be mechanically interconnected in a manner which will allow full required flow of one safety relief valve at all times. Still another exception is a safety relief valve manifold which allows one valve of two, three, four or more to be closed off and the remaining valve or valves will provide not less than the rate of discharge shown on the manifold nameplate.

(f) Safety relief valves shall have direct communication with the vapor space of the container.

(g) Each safety relief valve used with systems described in WAC 296-24-51011, 296-24-51017, 296-24-51019 and 296-24-51021 shall be plainly and permanently marked as follows:

- (i) With the letters "AA" or the symbol "NH3."
- (ii) The pressure in pounds per square inch gage (p.s.i.g.) at which the valve is set to start-to-discharge.
- (iii) The rate of discharge of the valve in cubic feet per minute of air at 60°F and atmospheric pressure (14.7 p.s.i.a.).
- (iv) The manufacturer's name and catalog number.

For example, a safety relief valve marked AA-250-4200 (air) would mean that this valve is suitable for use on an anhydrous ammonia container; that it is set to start-to-discharge at 250 p.s.i.g.; and that its rate of discharge (see subsection (8)(a) through (c) of this section) is four thousand two hundred cubic feet per minute of air.

(h) The flow capacity of the safety relief valve shall not be restricted by any connection to it on either the upstream or downstream side.

(i) The manufacturer or supplier of a safety relief valve manifold

shall publish complete data showing the flow rating through the combined assembly of the manifold with safety relief valves installed. The manifold flow rating shall be determined by testing the manifold with all but one valve discharging. If one or more openings have restrictions not present in the remaining openings, the restricted opening or openings or those having the lowest flow shall be used to establish the flow rate marked on the manifold nameplate. The marking shall be similar to that required in (g) of this subsection for individual valves.

(j) A hydrostatic relief valve shall be installed between each pair of valves in the liquid ammonia piping or hose where liquid may be trapped so as to relieve into the atmosphere at a safe location.

(k) Discharge from safety relief devices shall not terminate in or beneath any building.

(10) Safety. See CGA Pamphlet G-2, TFI Operational Safety Manual M-2 and MCA Safety Data Sheet SD-8 (see Appendix C for availability).

(a) Personnel required to handle ammonia shall be trained in safe operating practices and the proper action to take in the event of emergencies. Personnel shall be instructed to use the equipment listed in (c) of this subsection in the event of an emergency. (Rev. 1-22-76)

(b) If a leak occurs in an ammonia system, the personnel trained for and designated to act in such emergencies shall:

(i) See that persons not required to deal with an emergency are evacuated from the contaminated area.

(ii) Put on a suitable gas mask.

(iii) Wear gauntlet type plastic or rubber gloves and wear plastic or rubber suits in heavily contaminated atmospheres.

(iv) Shut off the appropriate valves.

(c) All stationary storage installations shall have at least:

(i) Two suitable gas masks in readily accessible locations. Full face masks with ammonia canisters as certified by NIOSH under 42 CFR Part 84, are suitable for emergency action for most leaks, particularly those that occur outdoors. For protection in concentrated ammonia atmospheres self-contained breathing apparatus is required.

(ii) One pair of protective gloves made of rubber or other material impervious to ammonia.

(iii) One pair of protective boots made of rubber or other material impervious to ammonia.

(iv) One protective slicker and/or protective pants and jacket made of rubber or other material impervious to ammonia.

(v) Easily accessible shower and/or at least fifty gallons of clean water in an open top container.

(vi) Tight fitting vented goggles or one full face shield.

(d) Where several persons are usually present, additional safety equipment may be desirable.

(e) Each tank motor vehicle transporting anhydrous ammonia, except farm applicator vehicles, shall carry a container of at least five gallons of water and shall be equipped with a full face gas mask, a pair of tight-fitting goggles or one full face shield. The driver shall be instructed in their use and the proper action to take to provide for his/her safety.

(f) If a leak occurs in transportation equipment and it is not practical to stop the leak, the driver should move the vehicle to an isolated location away from populated communities or heavily traveled highways.

(g) If liquid ammonia contacts the skin or eyes, the affected area should be promptly and thoroughly flushed with water. Do not use neutralizing solutions or ointments on affected areas. A physician shall treat all cases of eye exposure to liquid ammonia.

(11) Filling densities. (See WAC 296-24-51005(9).)

(a) The filling densities for nonrefrigerated containers shall not exceed the following:

	Aboveground	Underground
(i) Uninsulated	56% *	58%
(ii) Insulated	57%	
(iii)	DOT containers shall be filled in accordance with DOT regulations.	
	* This corresponds to 82% by volume at -28°F, 85% by volume at 5°F, 87.5% by volume at 30°F, and 90.6% by volume at 60°F.	

(b) The filling density for refrigerated storage tanks temperature corresponding to the vapor pressure at the start-to-discharge pressure setting of the safety relief valve.

(c) If containers are to be filled according to liquid level by any gaging method other than a fixed length dip tube gage, each container should have a thermometer well so that the internal liquid temperature can be easily determined and the amount of liquid and vapor in the container corrected to a 60°F basis.

(12) Transfer of liquids.

(a) Anhydrous ammonia shall always be at a temperature suitable for the material of construction and design of the receiving containers. Ordinary steels are not suitable for refrigerated ammonia. See Appendix R of API Standard 620 "Recommended Rules for Design and Construction of Large Welded Low-Pressure Storage Tanks" for materials for low temperature service.

(b) At least one attendant shall supervise the transfer of liquids from the time the connections are first made until they are finally disconnected.

(c) Flammable gases or gases which will react with ammonia (such as air) shall not be used to unload tank cars or transport trucks.

(d) Containers shall be charged or used only upon authorization of the owner.

(e) Containers shall be gaged and charged only in the open atmosphere or in buildings approved for that purpose.

(f) Pumps used for transferring ammonia shall be recommended and labeled for ammonia service by the manufacturer.

(i) Pumps shall be designed for at least 250 p.s.i.g. working pressure.

(ii) Positive displacement pumps shall have installed, off the discharge port, a constant differential relief valve discharging into the suction port of the pump through a line of sufficient size to carry the full capacity of the pump at relief valve setting, which setting and installation shall be according to pump manufacturer's recommendations.

(iii) On the discharge side of the pump, before the relief valve line, there shall be installed a pressure gage graduated from 0 to 400 p.s.i.g.

(iv) Plant piping shall contain shutoff valves located as close as practical to pump connections.

(g) Compressors used for transferring or refrigerating ammonia shall be recommended and labeled for ammonia service by the manufacturer.

(i) Compressors, except those used for refrigeration, shall be designed for at least 250 p.s.i.g. working pressure. Crank cases of compressors not designed to withstand system pressure shall be protected with a suitable safety relief valve.

(ii) Plant piping shall contain shutoff valves located as close as practical to compressor connections.

(iii) A safety relief valve large enough to discharge the full capacity of the compressor shall be connected to the discharge before any shutoff valve.

(iv) Compressors shall have pressure gages at suction and discharge graduated to at least one and one-half times the maximum pressure that can be developed.

(v) Adequate means, such as drainable liquid trap, may be provided on the compressor suction to minimize the entry of liquid into the compressor.

(vi) Where necessary to prevent contamination, an oil separator shall be provided on the discharge side of the compressor.

(h) Loading and unloading systems shall be protected by suitable devices to prevent emptying of the storage container or the container being loaded or unloaded in the event of severance of the hose. Backflow check valves or properly sized excess flow valves shall be installed where necessary to provide such protection. In the event that such valves are not practical, remotely operated shutoff valves may be installed.

(i) Meters used for the measurement of liquid anhydrous ammonia shall be recommended and labeled for ammonia service by the manufacturer.

(i) Liquid meters shall be designed for a minimum working pressure of 250 p.s.i.g.

(ii) The metering system shall incorporate devices that will prevent the inadvertent measurement of vapor.

(13) Tank car unloading points and operations.

(a) Provisions for unloading tank cars shall conform to the regulations of the department of transportation.

(b) Unloading operations shall be performed by reliable persons properly instructed and made responsible for careful compliance with all applicable procedures.

(c) Caution signs shall be so placed on the track or car as to give necessary warning to persons approaching car from open end or ends of siding and shall be left up until after car is unloaded and disconnected from discharge connections. Signs shall be of metal or other suitable material, at least twelve by fifteen inches in size and bear the words "STOP--Tank car connected" or "STOP--Men at work" the word "STOP," being in letters at least four inches high and the other words in letters at least two inches high. The letters shall be white on a blue background.

(d) The track of a tank car siding shall be substantially level.

(e) Brakes shall be set and wheels blocked on all cars being unloaded.

(f) Tank cars of anhydrous ammonia shall be unloaded only at approved locations meeting the requirements of subsections (9)(c) and (12)(h) of this section.

(14) Liquid level gaging device.

(a) Each container except those filled by weight shall be equipped with an approved liquid level gaging device.

(b) All gaging devices shall be arranged so that the maximum liquid level to which the container is filled is readily determined. (See subsection (4)(b)(vii) of this section.)

(c) Gaging devices that require bleeding of the product to the atmosphere such as the rotary tube, fixed tube, and slip tube devices, shall be designed so that the maximum opening of the bleed valve is not larger than No. 54 drill size unless provided with an excess flow valve. (This requirement does not apply to farm vehicles used for the application of ammonia as covered in WAC 296-24-51021.)

(d) Gaging devices shall have a design pressure equal to or greater than the design pressure of the container on which they are installed.

(e) Fixed liquid level gages shall be so designed that the maximum volume of the container filled by liquid shall not exceed eighty-five percent of its water capacity. The coupling into which the fixed liquid level gage is threaded must be placed at the eighty-five percent level of the container. If located elsewhere, the dip tube of this gage must be installed in such a manner that it cannot be readily removed.

Note: This does not apply to refrigerated storage.

(f) Gage glasses of the columnar type shall be restricted to stationary storage installation. They shall be equipped with shutoff valves having

metallic handwheels, with excess-flow valves, and with extra heavy glass adequately protected with a metal housing applied by the gage manufacturer. They shall be shielded against the direct rays of the sun.

(15) Painting of containers. Aboveground uninsulated containers should have a reflective surface maintained in good condition. White is recommended for painted surfaces, but other light reflecting colors are acceptable.

(16) Electrical equipment and wiring.

(a) Electrical equipment and wiring for use in ammonia installations shall be general purpose or weather resistant as appropriate.

(b) Where concentrations of ammonia in air in excess of sixteen percent by volume are likely to be encountered, electrical equipment and wiring shall be of a type specified by and be installed according to chapter 296-24 WAC Part L, for Class I, Group D locations.

#### AMENDATORY SECTION (Amending Order 76-6, filed 3/1/76)

**WAC 296-24-51011 Systems utilizing stationary, pier-mounted or skid-mounted aboveground or underground, nonrefrigerated storage.** This section applies to stationary, pier-mounted, skid-mounted, aboveground or underground, nonrefrigerated storage installations utilizing containers other than those constructed in accordance with department of transportation specifications. All basic rules of WAC 296-24-51009 apply to this section unless otherwise noted.

(1) Design pressure and construction of containers. The minimum design pressure for nonrefrigerated aboveground containers (~~((shall))~~) must be 250 psig. (See WAC 296-24-51009 (2)(a)(~~((i))~~)).

Note: U-68 and U-69 ASME Code containers with a design pressure of 200 psig are acceptable if recertified to 250 psig and equipped with safety relief valves set at 250 psig as permitted in WAC 296-24-51009 (9)(b).

(2) Container valves and accessories, filling and discharging connections.

(a) Each filling connection shall be provided with combination back-pressure check valve and excess flow valve; one double or two single back-pressure check valves; or a positive shutoff valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve.

(b) All vapor and liquid connections, except safety relief valves and those specifically exempt in WAC 296-24-51009 (6)(d) and (e) shall be equipped with approved excess flow valves; or in lieu thereof, may be fitted with approved quick-closing internal valves which, except during operating periods, shall remain closed.

(c) Each storage container shall be provided with a pressure gage graduated from 0 to 400 psig. Gages shall be designated for use in ammonia service.

(d) All containers shall be equipped with an approved vapor return valve.

(e) All containers shall be equipped with a fixed maximum liquid level gage.

(3) Safety relief devices.

(a) Every container shall be provided with one or more safety relief valves of spring-loaded or equivalent type and shall comply with the following:

(i) The discharge from safety relief valves shall be directed away from the container upward and unobstructed to the open air. Vent pipes shall not be restrictive or smaller in size than the safety relief outlet connection.

All safety relief valve discharges shall have suitable rain caps that will allow free discharge of the vapor and prevent the entrance of water. Suitable provision shall be made for draining condensate which may accumulate.

(ii) If desired, vent pipes from two or more safety relief devices located on the same unit, or similar lines from two or more different units, may be run into a common header, provided the cross-sectional area of such header is at least equal to the sum of the cross-sectional areas of the individual vent pipes.

(b) The rate of discharge of spring-loaded safety relief valves installed on underground containers may be reduced to a minimum of 30 percent of the rate of discharge specified in Appendix A. Containers so protected shall not be uncovered after installation until the liquid ammonia has been removed. Containers which may contain liquid ammonia before being installed underground and before being completely covered with earth are to be considered aboveground containers when determining the rate of discharge requirements of the safety relief valves.

(c) On underground installations where there is a probability of the manhole or housing becoming flooded, the discharge from vent lines shall be located above the high water level. All manholes or housings shall be provided with ventilated louvres or their equivalent, the area of such openings equaling or exceeding combined discharge areas of safety relief valves and vent lines which discharge their content into the manhole housing.

(4) Installation of storage containers.

(a) Containers installed aboveground shall be provided with substantial reinforced concrete footings and foundations or structural steel supports mounted on reinforced concrete foundations. In either case, the reinforced concrete foundations or footings shall extend below the established frost line and shall be of sufficient width and thickness to support the total weight of the containers and contents adequately. The foundation shall maintain the lowest point of the tank at not less than 18 inches above the ground. Floating type foundations shall also be acceptable providing the foundations are designed to adequately support the tank, contents and pumping equipment. (See WAC 296-24-51009(7).)

(b) Horizontal aboveground containers shall be mounted on foundations in such a manner as to permit expansion and contraction. Every container shall be supported so as to prevent the concentration of excessive loads on the supporting portion of the shell. The bearing afforded by the saddles shall extend over at least one third of the circumference of the shell. Suitable means for preventing corrosion shall be provided on that portion of the container in contact with the foundations or saddles.

(c) Containers buried underground shall be placed so that the top of the container is at least one foot below the surface of the ground. Should ground conditions make compliance with these requirements impracticable, precautions shall be taken to prevent physical damage to the container. It is not necessary to cover the portion of the container to which a manhole and other connections are affixed when necessary to prevent floating, containers shall be securely anchored or weighted.

(d) Underground containers shall be set on firm foundations (firm earth may be used) and surrounded with soft earth or sand well tamped in place. As a further means of resisting corrosion, the container, prior to being placed underground, shall be given a protective coating satisfactory to the authority having jurisdiction. Such protective coating shall be equivalent to hot dip galvanizing, or to two preliminary coatings of red lead followed by a heavy coating of coal tar or asphalt. The container thus coated shall be lowered into place in such a manner as to prevent abrasion or other damage to the coating.

(e) Distance between aboveground and underground containers of over 1,200 gallons capacity shall be at least five feet.

(f) Secure anchorage or adequate pier height shall be provided against container flotation wherever sufficiently high flood water might occur.

(5) Reinstallation of containers.

(a) Containers once installed underground shall not later be reinstalled aboveground or underground, unless they successfully withstand hydrostatic pressure retests at the pressure specified for the original hydrostatic test as required by the code under which the tank was constructed and show no evidence of serious corrosion.

(b) Where containers are reinstalled underground, the corrosion resistant coating shall be put in good condition; see WAC 296-24-51011 (4)(d). Where containers are reinstalled aboveground, safety relief devices or gaging devices shall comply with WAC 296-24-51009(9) and 296-24-51011(3) respectively for aboveground containers.

(6) Marking of containers. Each container or group of containers shall be marked on at least two sides with the words "anhydrous ammonia" or "caution--ammonia" in sharply contrasting colors with letters not less than four inches high.

(7) Protection of container appurtenances.

(a) Valves and other appurtenances shall be protected against physical damage. Main container shut-off valves shall be kept closed and locked when the installation is unattended. If the facility is protected against tampering by fencing or other suitable means, valve locks are not required.

(b) All connections to underground containers should be located within a substantial dome, housing or manhole fitted with a substantial removable cover. Appurtenances shall also be protected during the transit of containers intended for installation underground.

(c) Storage containers need not be grounded.

(8) Identification. A sign shall be displayed in a conspicuous place stating the name, address, and phone number of the nearest representative, agent, or owner of the storage system.

AMENDATORY SECTION (Amending Order 73-5, filed 5/9/73 and Order 73-4, filed 5/7/73)

**WAC 296-24-51015 Systems utilizing portable DOT containers.** This section applies specifically to systems utilizing cylinders, portable tanks (DOT-51), or "ton containers" (DOT-106A, DOT-110A), constructed in accordance with department of transportation specifications. All basic rules of WAC 296-24-51009 apply to this section, unless otherwise noted.

(1) Containers.

(a) Containers shall comply with department of transportation specifications and shall be maintained, filled, packaged, marked, labeled and shipped to comply with current DOT regulations and American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954 (R1970). (See Appendix C for availability.)

(b) Containers shall be stored in an area free from ignitable debris and in such manner as to prevent external corrosion. (Storage may be indoors or outdoors.)

(c) Containers shall not be buried below ground.

(d) Containers shall be set upon firm foundations or otherwise firmly secured. The possible effect of settling on the outlet piping shall be guarded against by a flexible connection or special fitting.

(e) Containers shall be protected from heat sources such as radiant flame and steam pipes. Do not apply heat directly to containers to raise the

pressure.

(f) Containers shall be stored in such manner as to protect them from moving vehicles or external damage.

(g) Any container which is designed to have a valve protection cap shall have the cap securely in place when the container is not in service.

(2) Container valves and regulating equipment.

(a) Container valves and pressure regulating equipment shall be protected against tampering when installed for use.

(b) Container valves shall be protected while in transit, in storage, and while being moved into final utilizations, as follows:

(i) By setting them into a recess of the container, or

(ii) By ventilated cap or collar, fastened to the container, capable of withstanding a blow from any direction equivalent to that of a 30-lb. weight dropped four feet. Construction must be such that a blow will not be transmitted to the valves or other connections.

(c) When containers are not connected for service, the outlet valves shall be kept tightly closed even though containers are considered empty.

(3) Safety relief devices. Containers shall be provided with safety relief devices as required by department of transportation regulations.

#### AMENDATORY SECTION (Amending Order 81-32, filed 12/24/81)

**WAC 296-24-60205 Equipment.** (1) Reels and cabinets. Where reels or cabinets are provided to contain fire hose, the employer shall assure that they are designed to facilitate prompt use of the hose valves, the hose, and other equipment at the time of a fire or other emergency. The employer shall assure that the reels and cabinets are conspicuously identified and used only for fire equipment.

(2) Hose outlets and connections.

(a) The employer shall assure that hose outlets and connections are located high enough above the floor to avoid being obstructed and to be accessible to employees.

(b) The employer shall standardize screw threads or provide appropriate adapters throughout the system and assure that the hose connections are compatible with those used on the supporting fire equipment.

(3) Hose.

(a) The employer shall assure that every one and one-half inch (3.8 cm) or smaller hose outlet used to meet this standard is equipped with hose connected and ready for use. In extremely cold climates where such installation may result in damaged equipment, the hose may be stored in another location provided it is readily available and can be connected when needed.

(b) Standpipe systems installed after July 1, 1982, for use by employees, shall be equipped with lined hose. Unlined hose may remain in use on existing systems. However, after the effective date of this standard, unlined hose which becomes unserviceable shall be replaced with lined hose.

(c) ~~((Beginning July 1, 1982, the employer shall provide hose of such length that friction loss resulting from water flowing through the hose will not decrease the pressure at the nozzle below 30 psi (210 kPa). The dynamic pressure at the nozzle shall be within the range of 30 psi (210 kPa) to 125 psi (860 kPa).))~~ Employers must provide hose of sufficient length so that friction, resulting from water flowing through the hose, does not decrease the pressure at the nozzle below 30 psi (210 kPa). The dynamic pressure at the nozzle must be within the range of 30 psi (210 kPa) to 125 psi (860 kPa).

(4) Nozzles. ((Beginning July 1, 1982, the employer shall assure))  
Employers must make sure that standpipe hoses ((is)) are equipped with shut-off type nozzles.

AMENDATORY SECTION (Amending Order 94-07, filed 7/20/94, effective 9/20/94)

**WAC 296-24-63499 Appendix D--Availability of publications incorporated by references in WAC 296-24-58505--Fire brigades.** The final standard for fire brigades, WAC 296-24-585, contains provisions which incorporate certain publications by reference. The publications provide criteria and test methods for protective clothing worn by those fire brigade members who are expected to perform interior structural fire fighting. The standard references the publications as the chief sources of information for determining if the protective clothing affords the required level of protection.

It is appropriate to note that the final standard does not require employers to purchase a copy of the referenced publications. Instead, employers can specify (in purchase orders to the manufacturers) that the protective clothing meet the criteria and test methods contained in the referenced publications and can rely on the manufacturers assurances of compliance. Employers, however, may desire to obtain a copy of the referenced publications for their own information.

The section designation of the standard where the referenced publications appear, the title of the publications, and the availability of the publications are as follows:

Section Designation	Referenced Publication	Available From
WAC 296-24-58513 (3)(b)	"Protective Clothing for Structural Fire Fighting." NFPA	National Fire Protection Association, Batterymarch Park, Quincy, MA 02269-9101.
WAC 296-24-58513 (4)(a)	"Development of Criteria for Fire Fighter's Gloves; Vol. II, Part II: Test Methods"(1976)	U.S. Government Printing Office, Washington, D.C. 20401. Stock No. for Vol. II is: 071-033-021-1.
WAC 296-24-58513 (5)(a)	"Model Performance Criteria for Structural Fire fighter's Helmets" (1977)	U.S. Fire Administration, National Fire Safety and Research Office, 16825 South Seton Avenue, Emmitsburg, Maryland 21727.

The referenced publications (or a microfiche of the publications) are available for review at many universities and public libraries throughout the country. These publications may also be examined at the OSHA Technical Data Center, Room N2439-Rear, United States Department of Labor, 200 Constitution Avenue Northwest, Washington, D.C. 20210 ((+202-523-9700)) (202-219-7500), or at any OSHA Regional Office (see telephone directories under United States Government-Labor Department).

**PART H-2**  
**SAFE PRACTICES ((~~OF ABRASIVE BLASTING OPERATIONS, VENTILATION~~)) AND**  
**VENTILATION OF ABRASIVE BLASTING OPERATIONS**

**Abrasive Blasting Operations**

AMENDATORY SECTION (Amending WSR 98-02-006, filed 12/26/97, effective 3/1/98)

**WAC 296-24-67513 Construction and maintenance of the exhaust ventilation systems.** (1) The construction, installation, inspection, and maintenance of exhaust systems must conform to the principles and requirements set forth in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ((~~29.2-1960~~)) Z9.2-1960 and ANSI Z33.1-1961.

Note: See the latest versions of ANSI Z9.2 and ANSI Z33.1 for current information on the installation, inspection and maintenance of exhaust systems.

(2) When dust leaks are noted, repairs must be made.

(3) The static pressure drop at the exhaust ducts leading from the equipment must be checked when the installation is completed and periodically thereafter to assure continued satisfactory operation.

(4) Whenever an appreciable change in the pressure drop indicates a partial blockage, the system must be cleaned and returned to normal operating conditions.

(5) In installations where the abrasive is recirculated, an abrasive separator must be provided to remove fines from the spent abrasives.

(6) The air exhausted from blast cleaning equipment must be discharged through dust collecting equipment.

(7) Dust collectors must be set up so that the accumulated dust can be emptied and removed without contaminating other working areas.

Note: Disposal of waste. The fine dust from dry collectors should be emptied into and transported in enclosed containers to prevent dispersal of the fines, or discharged into a sluice with some method to assure wetting of the dust.

AMENDATORY SECTION (Amending WSR 01-11-038, filed 5/9/01, effective 9/1/01)

**WAC 296-24-67515 Personal protective equipment.** (1) Employers must use only respirators certified by NIOSH under 42 CFR part 84 for protecting employees from dusts produced during abrasive-blasting operations.

(2) Abrasive-blasting respirators. Abrasive-blasting respirators must be worn by all abrasive-blasting operators in the following situations: (a) When working inside of blast cleaning rooms, or (b) when using silica sand in manual blasting operations except where the nozzle and blast are physically separated from the operator in an exhaust ventilated enclosure, or (c) where concentrations of toxic dusts dispersed by the abrasive blasting may exceed

the limits set in chapter 296-62 WAC, Part E except where the nozzle and blast are physically separated from the operator in an exhaust-ventilated enclosure.

(3) Particulate-filter respirators.

(a) Properly fitted particulate-filter respirators, commonly referred to as dust-filter respirators, may be used for short, intermittent, or occasional dust exposures such as clean-up, dumping of dust collectors, or unloading shipments of sand at a receiving point when it is not feasible to control the dust by enclosure, exhaust ventilation, or other means.

(b) Dust-filter respirators may also be used to protect the operator of outside (outdoor) abrasive-blasting operations where nonsilica abrasives are used on materials having low toxicity.

~~((Note: The selection of a dust filter respirator depends on the amount of dust in the breathing zone of the user. See WAC 296-62-07113-Table 5.))~~

(c) Dust-filter respirators used must be certified by NIOSH under 42 CFR part 84 for protection against the specific type of dust encountered.

(d) Dust-filter respirators must be properly fitted as required in chapter 296-62 WAC, Part E.

(e) Dust-filter respirators must not be used for continuous protection where silica sand is used as the blasting abrasive, or when toxic materials are blasted.

(4) A respiratory protection program as required in chapter 296-62 WAC, Part E must be established wherever it is necessary to use respirators.

(5) Personal protective clothing.

(a) Operators must be equipped with heavy canvas or leather gloves and aprons or equivalent protection to protect them from the impact of abrasives.

(b) Safety shoes must be worn where there is a hazard of foot injury.

(c) Equipment for protection of the eyes and face must be supplied to the operator and to other personnel working near abrasive blasting operations when the respirator design does not provide such protection.

(6) Personal protective clothing, equipment and their use must comply with WAC 296-800-160.

AMENDATORY SECTION (Amending WSR 01-23-060, filed 11/20/01, effective 12/1/01)

**WAC 296-32-250 Tools and personal protective equipment--General.** (1) Personal protective equipment, protective devices and special tools needed for the work of employees shall be provided and the employer shall ensure that they are used by employees.

(a) Before each day's use the employer shall ensure that these personal protective devices, tools, and equipment are carefully inspected by a competent person to ascertain that they are in good condition.

(b) Tools found to be defective shall be taken out of service.

(2) Head protection. ~~((Class B protective helmets shall be provided whenever there is exposure to overhead hazards and/or possible high voltage electrical contact.~~

~~(a) Employees working in areas where there is a possible danger of head injury from impact, falling or flying objects, shall be protected by protective helmets.~~

~~(b) Criteria for protective helmets.~~

~~(i) Protective helmets purchased after February 20, 1995, shall comply with ANSI Z89.1-1986, "American National Standard for Personnel Protection--Protective Headwear for Industrial Workers--Requirements," which is incorporated by reference, or shall be demonstrated to be equally effective.~~

~~(ii) Protective helmets purchased before February 20, 1995, shall comply with the ANSI standard "American National Standard Safety Requirements for Industrial Head Protection," ANSI Z89.1-1969, or shall be demonstrated by the employer to be equally effective.))~~ Head protection meeting the requirements of ANSI Z89.2-1971, "Safety Requirements for Industrial Protective Helmets for Electrical Workers, Class B", must be provided whenever there is possible exposure to high voltage electrical contact. Employers must make sure that employees use the head protection.

(3) Eye protection. Protective eye and face equipment shall be required where there is a possibility of injury that can be prevented by such equipment. In such cases, employers shall make conveniently available a type of protector suitable for the work to be performed, and employees shall use such protectors.

Note: See WAC 296-800-160 for additional personal protective equipment requirements.

(4) Tent heaters, torches and open flame. Open flames shall not be used within ground tents or on platforms within aerial tents unless:

(a) The tent covers are constructed of fire resistant materials, and

(b) Ventilation is provided to maintain safe oxygen levels and avoid harmful buildup of combustion products and combustible gases.

(5) Portable power equipment.

(a) All portable power equipment used in the telecommunications industry shall be grounded.

(b) Nominal 120V, or less, portable generators used for providing power at work locations do not require grounding if the output circuit is completely isolated from the frame of the unit.

(c) Grounding shall be omitted when using soldering irons, guns or wire-wrap tools on telecommunication circuits.

(6) Vehicle-mounted utility generators. Vehicle-mounted utility generators used for providing nominal 240V AC or less for powering portable tools and equipment need not be grounded to earth if all of the following conditions are met:

(a) One side of the voltage source is solidly strapped to the metallic

structure of the vehicle;

(b) Grounding-type outlets are used, with a "grounding" conductor between the outlet grounding terminal and the side of the voltage source that is strapped to the vehicle;

(c) All metallic encased tools and equipment that are powered from this system are equipped with three-wire cords and grounding-type attachment plugs, except as designated in subsection (7) of this section.

(7) Portable lights, tools and appliances. When operated from commercial power such metal parts of these devices shall be grounded, unless these tools or appliances are protected by a system of double insulation, or its equivalent. Where such a system is employed, the equipment shall be distinctively marked to indicate double insulation.

(8) Lead work. When operated from commercial power the metal housing of electric solder pots shall be grounded. Electric solder pots may be used with the power equipment described in this subsection, without a grounding conductor.

The employer shall ensure that wiping gloves or cloths and eye protection are used in lead wiping operations. A drip pan to catch hot lead drippings shall also be provided and used.

(9) Fire extinguishers.

(a) Fire extinguishers shall be provided for the protection of both the building structure and the occupancy hazards contained therein.

(b) Employees shall be familiar with the location and operation of fire extinguishers.

(c) Any fire extinguishers showing defects shall be removed from service.

(d) Fire extinguishers shall be thoroughly examined and/or recharged or repaired to insure operability and safety once every year.

(e) Each fire extinguisher shall have a durable tag securely attached to show the maintenance or recharge date and the initials or signature of the person performing this service.

Note: For additional requirements relating to portable fire extinguishers see WAC 296-800-300.

#### AMENDATORY SECTION (Amending Order 94-07, filed 7/20/94, effective 9/20/94)

**WAC 296-32-280 Ladders.** (1) The employer shall ensure that no employee nor any material or equipment shall be supported or permitted to be supported on any portion of a ladder unless it is first determined, by inspections and checks conducted by a competent person that such ladder is free of defects, in good condition and secured in place.

(2) The spacing between steps or rungs permanently installed on poles and towers shall be no more than 18 inches (36 inches on any one side). This requirement also applies to fixed ladders on towers, when towers are so equipped. Spacing between steps shall be uniform above the initial unstepped section, except where working, standing, or access steps are required. Fixed ladder rungs and step rungs for poles and towers shall have a minimum diameter of 5/8 inch. Fixed ladder rungs shall have a minimum clear width of 12 inches. Steps for poles and towers shall have a minimum clear width of 4-1/2 inches. The spacing between detachable steps may not exceed 30 inches on any one side, and these steps shall be secured when in use.

(3) (~~((After October 31, 1975,))~~) Portable wood ladders intended for general use (~~((shall))~~) must not be painted, but may be coated with a translucent nonconductive coating. Portable wood ladders (~~((shall))~~) must not be longitudinally reinforced with metal.

(4) Portable wood ladders that are not being carried on vehicles and are not in active use shall be stored where they will not be exposed to the elements and where there is good ventilation.

(5) Rolling ladders.

(a) Rolling ladders used in telecommunication centers shall have a width between the side rails, inside to inside, of at least 12 inches.

(b) Except in working spaces that are not a means of egress, the ladders shall have a minimum inside width, between the side rails, of at least eight inches.

(6) Climbing ladders or stairways on scaffolds used for access and egress shall be affixed or built into the scaffold by proper design and engineering, and shall be so located that their use will not disturb the stability of the scaffold. The rungs of the climbing device shall be equally spaced, but may not be less than 12 inches nominal nor more than 16 inches nominal apart. Horizontal end rungs used for platform support may also be utilized as a climbing device if such rungs meet the spacing requirement of this subsection, and if clearance between the rung and the edge of the platform is sufficient to afford a secure handhold. If a portable ladder is affixed to the scaffold, it shall be securely attached and shall have rungs meeting the spacing requirements of this subsection. Clearance shall be provided in the back of the ladder of not less than 6 inches from center of rung to the nearest scaffold structural member.

(7) When a ladder is supported by an aerial strand, and ladder hooks or other supports are not being used, the ladder shall be extended at least 2 feet above the strand and shall be secured to it (e.g. lashed or held by a safety strap around the strand and ladder side rail). When a ladder is supported by a pole, it shall be securely lashed to the pole unless the ladder is specifically designed to prevent movement when used in this application.

(8) Portable wood straight ladders, when in use, shall be equipped with safety shoes.

(9) Ladders shall be inspected by a competent person prior to each use. Ladders which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as "dangerous do not use."

AMENDATORY SECTION (Amending Order 94-07, filed 7/20/94, effective 9/20/94)

**WAC 296-62-07302 List of carcinogens.** (1) The following substances are deemed to be carcinogens for the purposes of WAC 296-62-073 through 296-62-07316.

(2) Any reference to carcinogens in WAC 296-62-07304 through 296-62-07316 shall mean only those carcinogens listed in WAC 296-62-07302.

(a) 4-Nitrobiphenyl - Chemical Abstracts Service Registry Number 92-93-3.

(b) Alpha-Naphthylamine - Chemical Abstracts Service Registry Number 134-32-7.

(c) 4,4' Methylene bis (2 - chloroaniline) - Chemical Abstracts Service Registry Number 101-14-4.

(d) Methyl chloromethyl ether - Chemical Abstracts Service Registry Number 107-30-2.

(e) 3,3'-Dichlorobenzidine (and its salts) - Chemical Abstracts Service Registry Number 91-94-1.

(f) Bis-Chloromethyl ether - Chemical Abstracts Service Registry Number 542-88-1.

(g) Beta-Naphthylamine - Chemical Abstracts Service Registry Number 91-59-8.

(h) Benzidine - Chemical Abstracts Service Registry Number 92-87-5.

(i) 4-Aminodiphenyl - Chemical Abstracts Service Registry Number 92-67-1.

(j) Ethyleneimine - Chemical Abstracts Service Registry Number 151-56-4.

(k) Beta-Propiolactone - Chemical Abstracts Service Registry Number 57-57-8.

(l) 2-Acetylaminofluorene - Chemical Abstracts Service Registry Number 53-96-3.

(m) 4-Dimethylaminoazobenzene - Chemical Abstract Service Registry Number 60-11-7.

(n) N-Nitrosodimethylamine - Chemical Abstracts Service Registry Number 62-75-9.

AMENDATORY SECTION (Amending Order 87-24, filed 11/30/87)

**WAC 296-62-07304 Definitions.** The definitions set forth in this section apply throughout WAC 296-62-073 through 296-62-07316.

(1) Absolute filter - is one capable of retaining 99.97 percent of a mono disperse aerosol of 0.3 micron size particles.

(2) Authorized employee - an employee whose duties require him to be in the regulated area and who has been specifically assigned to those duties by the employer.

(3) Clean change room - a room where employees put on clean clothing and/or protective equipment in an environment free of carcinogens listed in WAC 296-62-07302. The clean change room shall be contiguous to and have an entry from a shower room, when the shower room facilities are otherwise required in this section.

(4) Closed system - an operation involving carcinogens listed in WAC 296-62-07302 where containment prevents the release of carcinogens (~~into regulated areas, or the external environment~~)).

(5) Decontamination - the inactivation of a carcinogen listed in WAC 296-62-07302 or its safe disposal.

(6) Disposal - the safe removal of a carcinogen listed in WAC 296-62-07302 from the work environment.

(7) Emergency - an unforeseen circumstance or set of circumstances resulting in the release of a carcinogen which may result in exposure to or contact with any carcinogen listed in WAC 296-62-07302.

(8) External environment - any environment external to regulated and nonregulated areas.

(9) Isolated system - a fully enclosed structure other than the vessel of containment of a listed carcinogen which is impervious to the passage of listed carcinogens and which would prevent the entry of carcinogens into regulated areas, nonregulated areas, or the external environment, should leakage or spillage from the vessel of containment occur.

(10) Laboratory-type hood - a device enclosed on three sides and the top and bottom, designed and maintained so as to draw air inward at an average linear face velocity of 150 feet per minute with a minimum of 125 feet per minute, designed, constructed and maintained such that an operation involving a listed carcinogen within the hood does not require the insertion of any portion of any employees' body other than his hands and arms.

(11) Nonregulated area - any area under the control of the employer where entry and exit is neither restricted nor controlled.

(12) Open-vessel system - an operation involving listed carcinogens in an open vessel, which is not in an isolated system, a laboratory-type hood, nor in any other system affording equivalent protection against the entry of carcinogens into regulated areas, nonregulated areas, or the external environment.

(13) Protective clothing - clothing designed to protect an employee against contact with or exposure to listed carcinogens.

(14) Regulated area - an area where entry and exit is restricted and controlled.

#### AMENDATORY SECTION (Amending Order 81-4, filed 3/17/81)

**WAC 296-62-07312 Reports.** (1) Operations. Not later than October 30, 1974, the information required in WAC 296-62-07312 (1)(a), (b), (c) and (d) of this section (~~shall~~) must be reported in writing to the (~~industrial hygiene section, division of industrial safety and health. Any changes in such information shall be similarly~~) Department of Labor and Industries, WISHA Services Division, Policy and Technical Services, P.O. Box 44610, Olympia, WA 98504-4610. Any changes in the information must also be reported in writing within 15 calendar days of (~~such~~) the change.

(a) A brief description and in plant location of the area(s) regulated and the address of each regulated area;

(b) The name(s) and other identifying information as to the presence of listed carcinogens in each regulated area;

(c) The number of employees in each regulated area, during normal operations including maintenance activities; and

(d) The manner in which a carcinogen is present in each regulated area; e.g., whether it is manufactured, processed, used, repackaged, released, stored, or otherwise handled.

(2) Incidents. Incidents which result in the release of a listed carcinogen into any area where employees may be potentially exposed shall be reported in accordance with this subsection.

(a) ~~((A report of the occurrence of the incident and the facts obtainable at that time including a report on any medical treatment of affected employees shall be made within 24 hours to the industrial hygiene section, division of industrial safety and health.~~

~~(b) A written report shall be filed with the industrial hygiene section, division of industrial safety and health, within 15 calendar days thereafter and shall include:))~~ The occurrence of the incident, including any facts obtainable at that time, as well as a report on any medical treatment of affected employees, must be reported within 24 hours to the Department of Labor and Industries, WISHA Services Division, Policy and Technical Services, P.O. Box 44610, Olympia, WA 98504-4610.

(b) A written report must be filed with the Department of Labor and Industries, WISHA Services Division, Policy and Technical Services, P.O. Box 44610, Olympia, WA 98504-4610, within 15 calendar days after the incident occurs, and must include:

(i) A specification of the amount of material released, the amount of time involved, and an explanation of the procedure used in determining this figure;

(ii) A description of the area involved, and the extent of known and possible employee exposure and area contamination;

(iii) A report of any medical treatment of affected employees, and any medical surveillance program implemented; and

(iv) An analysis of the circumstances of the incident, and measures taken or to be taken, with specific completion dates, to avoid further similar releases.

#### CARCINOGEN STANDARD REPORT

Company: ..... Prepared By: .....  
Plant Address: ..... Title: .....  
Date: .....

Compound and Other Identifying Information	Description of Implant Location of Regulated Area*	Number of Employees in Each Regulated Area* Normally Maintenance	Manner** In
			Which Compound is Present in Each Regulated Area*

\*See WAC 296-62-07308 for definition of "regulated area."

\*\*Indicated whether manufactured, processed, used, repackaged, released, stored, or if otherwise handled (describe).

AMENDATORY SECTION (Amending Order 93-01, filed 3/13/93, effective 4/27/93)

**WAC 296-62-07421 Housekeeping.** (1) All surfaces shall be maintained as free as practicable of accumulations of cadmium.

(2) All spills and sudden releases of material containing cadmium shall be cleaned up as soon as possible.

(3) Surfaces contaminated with cadmium shall, wherever possible, be cleaned by vacuuming or other methods that minimize the likelihood of cadmium becoming airborne.

(4) HEPA-filtered vacuuming equipment or equally effective filtration methods shall be used for vacuuming. The equipment shall be used and emptied in a manner that minimizes the reentry of cadmium into the workplace.

(5) Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other methods that minimize the likelihood of cadmium becoming airborne have been tried and found not to be effective.

(6) Compressed air shall not be used to remove cadmium from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the dust cloud created by the compressed air.

(7) Waste, scrap, debris, bags, containers, personal protective equipment, and clothing contaminated with cadmium and consigned for disposal (~~shall~~) must be collected and disposed of in sealed impermeable bags or other closed, impermeable containers. These bags and containers (~~shall~~) must be labeled in accordance with WAC 296-62-07425(~~(2)~~) (3).

AMENDATORY SECTION (Amending WSR 97-19-014, filed 9/5/97, effective 11/5/97)

**WAC 296-62-07501 Airborne contaminants.** (1) Permissible exposure limits (PELs) refer to airborne concentrations of substances without regard to the use of respiratory protection and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the permissible limit, a smaller percentage may be affected more seriously by aggravation of a preexisting condition or by development of an occupational illness.

(2) Permissible exposure limits refer to time-weighted concentrations for an 8-hour workday within a 40-hour workweek which shall not be exceeded.

(a) The cumulative time-weighted average exposure for an 8-hour work shift shall be computed as follows:

$$E = \frac{C_a T_a + C_b T_b + \dots + C_n T_n}{8}$$

where:

E is the equivalent exposure for the working shift.

C is the concentration during any period of time  
T where the concentration remains constant.

T is the duration in hours of the exposure at the  
concentration C.

The value of E shall not exceed the eight-hour  
time-weighted average (TWA) limit in Table 1 (see  
WAC 296-62-07515), for the material involved.

(b) To illustrate the formula, assume that substance A has an 8-hour  
time-weighted average limit of 100 ppm as noted in Table 1 of WAC 296-62-  
07515. Assume that an employee is subject to the following exposure:

Two hours exposure at 150 ppm

Two hours exposure at 75 ppm

Four hours exposure at 50 ppm

Substituting this information in the formula, we have

$$(2 \times 150 + 2 \times 75 + 4 \times 50) \div 8 = 81.25 \text{ ppm}$$

Since 81.25 ppm is less than 100 ppm, the 8-hour time-weighted average  
limit, the exposure is acceptable.

(3) Methods of compliance:

(a) To achieve compliance with these standards, the employer shall  
determine and implement feasible administrative or engineering controls.

(b) When administrative or engineering controls are not feasible to  
achieve full compliance, they shall nonetheless be used to reduce exposures  
to the lowest levels achievable by these controls.

(c) Any control equipment or technical measure utilized for the purpose  
of complying with WAC 296-62-07501(3) must be approved for each particular  
use by a competent industrial hygienist or other technically qualified  
person. Whenever respirators are used their use shall comply with (~~WAC 296-  
62-071 through 296-62-07121~~) chapter 296-62 WAC, Part E.

(d) Upon request, the employer shall prepare and submit a written  
compliance plan to the director. This plan must include a description of the  
manner in which compliance will be achieved with respect to cited violations  
of WAC 296-62-07501(3), and shall include proposed abatement methods,  
anticipated completion dates, and provision for progress reports to be sent  
to the department.

(4) An employee's exposure to any substance in Table 1 (see WAC 296-62-  
07515) which does not have a ceiling or a specified short-term exposure limit  
(STEL) shall not exceed the generic STEL which is computed by multiplying the  
applicable eight-hour time-weighted average (TWA) for the substance by the  
appropriate multiplier listed below.

Eight-hour TWA	Multiplier
PEL > 0-1	(ppm or mg/M <sup>3</sup> ) x 3
PEL > 1-10	(ppm or mg/M <sup>3</sup> ) x 2
PEL > 10-100	(ppm or mg/M <sup>3</sup> ) x 1.5
PEL > 100-1000	(ppm or mg/M <sup>3</sup> ) x 1.25
PEL > 1000	(ppm or mg/M <sup>3</sup> ) x 1

(5) Permissible limits are based on the best available information from  
industrial experience, from experimental human and animal studies, and, when

possible, from a combination of the three. The basis on which the values are established may differ from substance to substance; protection against impairment of health may be a guiding factor for some, whereas reasonable freedom from irritation, narcosis, nuisance or other forms of stress may form the basis for others.

(6) The limits based on physical irritation shall be considered no less binding than those based on physical impairment. There is increasing evidence that physical irritation may initiate, promote or accelerate physical impairment through interaction with other chemical or biologic agents.

(7) In spite of the fact that serious injury is not believed likely as a result of exposure to the permissible limit concentrations, the best practice is to maintain concentrations of all atmospheric contaminants as low as is practical.

(8) These limits are intended for use in the practice of industrial hygiene and should be interpreted and applied only by a technically qualified person.

AMENDATORY SECTION (Amending Order 88-23, filed 10/6/88, effective 11/7/88)

**WAC 296-62-07527 Appendix B substance technical guidelines--Benzene.**

(1) Physical and chemical data.

(a) Substance identification.

(i) Synonyms: Benzol, benzole, coal naphtha, cyclohexatriene, phene, phenyl hydride, pyrobenzol. (Benzin, petroleum benzin and Benzine do not contain benzene.)

(ii) Formula:  $C_6H_6$  (CAS Registry Number: 71-43-2).

(b) Physical data.

(i) Boiling point (760 mm Hg): 80.1 C (176 F).

(ii) Specific gravity (water=1): 0.879.

(iii) Vapor density (air=1): 2.7.

(iv) Melting point: 5.5 C (42 F).

(v) Vapor pressure at 20 C (68 F): 75 mm Hg.

(vi) Solubility in water: .06%.

(vii) Evaporation rate (ether=1): 2.8.

(viii) Appearance and odor: Clear, colorless liquid with a distinctive sweet odor.

(2) Fire, explosion, and reactivity hazard data.

(a) Fire.

(i) Flash point (closed cup): -11 C (12 F).

(ii) Autoignition temperature: 580 C (1076 F).

(iii) Flammable limits in Air. % by volume: Lower: 1.3%, Upper: 7.5%.

(iv) Extinguishing media: Carbon dioxide, dry chemical, or foam.

(v) Special fire-fighting procedures: Do not use solid stream of water, since stream will scatter and spread fire. Fine water spray can be used to keep fire-exposed containers cool.

(vi) Unusual fire and explosion hazards: Benzene is a flammable liquid. Its vapors can form explosive mixtures. All ignition sources must be controlled when benzene is used, handled, or stored. Where liquid or vapor may be released, such areas shall be considered as hazardous locations. Benzene vapors are heavier than air; thus the vapors may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which benzene is handled.

(vii) Benzene is classified as a 1 B flammable liquid for the purpose of conforming to the requirements of WAC 296-24-330. A concentration exceeding 3,250 ppm is considered a potential fire explosion hazard. Locations where benzene may be present in quantities sufficient to produce explosive or ignitable mixtures are considered Class I Group D for the purposes of conforming to the requirements of WAC 296-24-95613.

(b) Reactivity.

(i) Conditions contributing to instability: Heat.

(ii) Incompatibility: Heat and oxidizing materials.

(iii) Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide).

(3) Spill and leak procedures.

(a) Steps to be taken if the material is released or spilled. As much benzene as possible should be absorbed with suitable materials, such as dry sand or earth; ~~((benzine))~~ benzene remaining must be flushed with large amounts of water. Do not flush benzene into a confined space, such as a sewer, because of explosion danger. Remove all ignition sources. Ventilate enclosed places.

(b) Waste disposal method. Disposal methods must conform to other jurisdictional regulations. If allowed, benzene may be disposed of:

(i) By absorbing it in dry sand or earth and disposing in a sanitary landfill;

(ii) If small quantities, by removing it to a safe location from buildings or other combustible sources, pouring it in dry sand or earth and cautiously igniting it; and

(iii) If large quantities, by atomizing it in a suitable combustion chamber.

(4) Miscellaneous precautions.

(a) High exposure to benzene can occur when transferring the liquid from one container to another. Such operations should be well ventilated and good work practices must be established to avoid spills.

(b) Use nonsparking tools to open benzene containers which are effectively grounded and bonded prior to opening and pouring.

(c) Employers must advise employees of all plant areas and operations where exposure to benzene could occur. Common operations in which high exposures to benzene may be encountered are: The primary production and utilization of benzene, and transfer of benzene.

#### AMENDATORY SECTION (Amending WSR 01-11-038, filed 5/9/01, effective 9/1/01)

**WAC 296-62-07540 Formaldehyde.** (1) Scope and application. This standard applies to all occupational exposures to formaldehyde, i.e., from formaldehyde gas, its solutions, and materials that release formaldehyde.

(2) Definitions. For purposes of this standard, the following definitions shall apply:

(a) "Action level" means a concentration of 0.5 part formaldehyde per million parts of air (0.5 ppm) calculated as an 8-hour time-weighted average (TWA) concentration.

(b) "Approved" means approved by the director of the department of labor and industries or his/her authorized representative: Provided, however, That should a provision of this chapter state that approval by an agency or organization other than the department of labor and industries is required, such as Underwriters' Laboratories or the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health,

the provision of WAC 296-800-370 shall apply.

(c) "Authorized person" means any person required by work duties to be present in regulated work areas, or authorized to do so by the employer, by this section of the standard, or by the WISHA Act.

(d) "Director" means the director of the department of labor and industries, or his/her designated representative.

(e) "Emergency" is any occurrence, such as but not limited to equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled release of a significant amount of formaldehyde.

(f) "Employee exposure" means the exposure to airborne formaldehyde which would occur without corrections for protection provided by any respirator that is in use.

(g) "Formaldehyde" means the chemical substance, HCHO, Chemical Abstracts Service Registry No. 50-00-0.

(3) Permissible exposure limit (PEL).

(a) TWA: The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds 0.75 part formaldehyde per million parts of air as an 8-hour TWA.

(b) Short term exposure limit (STEL): The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds two parts formaldehyde per million parts of air (2 ppm) as a fifteen-minute STEL.

(4) Exposure monitoring.

(a) General.

(i) Each employer who has a workplace covered by this standard shall monitor employees to determine their exposure to formaldehyde.

(ii) Exception. Where the employer documents, using objective data, that the presence of formaldehyde or formaldehyde-releasing products in the workplace cannot result in airborne concentrations of formaldehyde that would cause any employee to be exposed at or above the action level or the STEL under foreseeable conditions of use, the employer will not be required to measure employee exposure to formaldehyde.

(iii) When an employee's exposure is determined from representative sampling, the measurements used shall be representative of the employee's full shift or short-term exposure to formaldehyde, as appropriate.

(iv) Representative samples for each job classification in each work area shall be taken for each shift unless the employer can document with objective data that exposure levels for a given job classification are equivalent for different workshifts.

(b) Initial monitoring. The employer shall identify all employees who may be exposed at or above the action level or at or above the STEL and accurately determine the exposure of each employee so identified.

(i) Unless the employer chooses to measure the exposure of each employee potentially exposed to formaldehyde, the employer shall develop a representative sampling strategy and measure sufficient exposures within each job classification for each workshift to correctly characterize and not underestimate the exposure of any employee within each exposure group.

(ii) The initial monitoring process shall be repeated each time there is a change in production, equipment, process, personnel, or control measures which may result in new or additional exposure to formaldehyde.

(iii) If the employer receives reports or signs or symptoms of respiratory or dermal conditions associated with formaldehyde exposure, the employer shall promptly monitor the affected employee's exposure.

(c) Periodic monitoring.

(i) The employer shall periodically measure and accurately determine exposure to formaldehyde for employees shown by the initial monitoring to be exposed at or above the action level or at or above the STEL.

(ii) If the last monitoring results reveal employee exposure at or above the action level, the employer shall repeat monitoring of the employees

at least every six months.

(iii) If the last monitoring results reveal employee exposure at or above the STEL, the employer shall repeat monitoring of the employees at least once a year under worst conditions.

(d) Termination of monitoring. The employer may discontinue periodic monitoring for employees if results from two consecutive sampling periods taken at least seven days apart show that employee exposure is below the action level and the STEL. The results must be statistically representative and consistent with the employer's knowledge of the job and work operation.

(e) Accuracy of monitoring. Monitoring shall be accurate, at the ninety-five percent confidence level, to within plus or minus twenty-five percent for airborne concentrations of formaldehyde at the TWA and the STEL and to within plus or minus thirty-five percent for airborne concentrations of formaldehyde at the action level.

(f) Employee notification of monitoring results. Within fifteen days of receiving the results of exposure monitoring conducted under this standard, the employer shall notify the affected employees of these results. Notification shall be in writing, either by distributing copies of the results to the employees or by posting the results. If the employee exposure is over either PEL, the employer shall develop and implement a written plan to reduce employee exposure to or below both PELs, and give written notice to employees. The written notice shall contain a description of the corrective action being taken by the employer to decrease exposure.

(g) Observation of monitoring.

(i) The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to formaldehyde required by this standard.

(ii) When observation of the monitoring of employee exposure to formaldehyde requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the clothing and equipment to the observer, require the observer to use such clothing and equipment, and assure that the observer complies with all other applicable safety and health procedures.

(5) Regulated areas.

(a) The employer shall establish regulated areas where the concentration of airborne formaldehyde exceeds either the TWA or the STEL and post all entrances and accessways with signs bearing the following information:

DANGER  
FORMALDEHYDE  
IRRITANT AND POTENTIAL CANCER HAZARD  
AUTHORIZED PERSONNEL ONLY

(b) The employer shall limit access to regulated areas to authorized persons who have been trained to recognize the hazards of formaldehyde.

(c) An employer at a multi-employer worksite who establishes a regulated area shall communicate the access restrictions and locations of these areas to other employers with work operations at that worksite.

(6) Methods of compliance.

(a) Engineering controls and work practices. The employer shall institute engineering and work practice controls to reduce and maintain employee exposures to formaldehyde at or below the TWA and the STEL.

(b) Exception. Whenever the employer has established that feasible engineering and work practice controls cannot reduce employee exposure to or below either of the PELs, the employer shall apply these controls to reduce employee exposures to the extent feasible and shall supplement them with respirators which satisfy this standard.

(7) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the

requirements of this subsection. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls;

(ii) Work operations, such as maintenance and repair activities or vessel cleaning, for which the employer establishes that engineering and work-practice controls are not feasible;

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce exposure to or below the PELs;

(iv) Emergencies.

(b) Respirator program.

(i) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1), 296-62-07131 (4)((b)(i) and (ii))), and 296-62-07150 through 296-62-07156).

(ii) If air-purifying chemical-cartridge respirators are used, the employer must:

(A) Replace the cartridge after three hours of use or at the end of the workshift, whichever occurs first, unless the cartridge contains a NIOSH-certified end-of-service-life indicator (ESLI) to show when breakthrough occurs.

(B) Unless the canister contains a NIOSH-certified ESLI to show when breakthrough occurs, replace canisters used in atmospheres up to 7.5 ppm (10 x PEL) every four hours and industrial-sized canisters used in atmospheres up to 75 ppm (100 x PEL) every two hours, or at the end of the workshift, whichever occurs first.

(c) Respirator selection.

(i) The employer must select appropriate respirators from Table 1 of this section.

TABLE 1  
MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION  
AGAINST FORMALDEHYDE

Condition of use or formaldehyde concentration (ppm)	Minimum respirator required <sup>1</sup>
Up to 7.5 ppm (10 x PEL)	Full facepiece with cartridges or canisters specifically approved for protection against formaldehyde <sup>2</sup> .
Up to 75 ppm (100 x PEL)	Full-face mask with chin style or chest or back mounted type industrial size canister specifically approved for protection against formaldehyde. Type C supplied-air respirator pressure demand or continuous flow type, with full facepiece, hood, or helmet.
Above 75 ppm or unknown (emergencies) (100 x PEL)	Self-contained breathing apparatus (SCBA) with positive-pressure full facepiece. Combination supplied-air, full facepiece positive-pressure respirator with auxiliary self-contained air supply.
Fire fighting	SCBA with positive-pressure in full facepiece.
Escape	SCBA in demand or pressure demand mode. Full-face mask with chin style or front or back mounted type industrial size canister specifically approved for protection against formaldehyde.

<sup>1</sup> Respirators specified for use at higher concentrations may be used at lower concentrations.

<sup>2</sup> A half-mask respirator with cartridges specifically approved for protection against formaldehyde can be substituted for the full facepiece respirator providing that effective gas-proof goggles are provided and used in combination with the half-mask respirator.

(ii) The employer must provide a powered air-purifying respirator adequate to protect against formaldehyde exposure to any employee who has difficulty using a negative-pressure respirator.

(8) Protective equipment and clothing. Employers shall comply with the provisions of WAC 296-800-160. When protective equipment or clothing is provided under these provisions, the employer shall provide these protective devices at no cost to the employee and assure that the employee wears them.

(a) Selection. The employer shall select protective clothing and equipment based upon the form of formaldehyde to be encountered, the conditions of use, and the hazard to be prevented.

(i) All contact of the eyes and skin with liquids containing one percent or more formaldehyde shall be prevented by the use of chemical protective clothing made of material impervious to formaldehyde and the use of other personal protective equipment, such as goggles and face shields, as appropriate to the operation.

(ii) Contact with irritating or sensitizing materials shall be prevented to the extent necessary to eliminate the hazard.

(iii) Where a face shield is worn, chemical safety goggles are also required if there is a danger of formaldehyde reaching the area of the eye.

(iv) Full body protection shall be worn for entry into areas where concentrations exceed 100 ppm and for emergency reentry into areas of unknown concentration.

(b) Maintenance of protective equipment and clothing.

(i) The employer shall assure that protective equipment and clothing that has become contaminated with formaldehyde is cleaned or laundered before its reuse.

(ii) When ventilating formaldehyde-contaminated clothing and equipment, the employer shall establish a storage area so that employee exposure is minimized. Containers for contaminated clothing and equipment and storage areas shall have labels and signs containing the following information:

DANGER  
FORMALDEHYDE-CONTAMINATED (CLOTHING) EQUIPMENT  
AVOID INHALATION AND SKIN CONTACT

(iii) The employer shall assure that only persons trained to recognize the hazards of formaldehyde remove the contaminated material from the storage area for purposes of cleaning, laundering, or disposal.

(iv) The employer shall assure that no employee takes home equipment or clothing that is contaminated with formaldehyde.

(v) The employer shall repair or replace all required protective clothing and equipment for each affected employee as necessary to assure its effectiveness.

(vi) The employer shall inform any person who launders, cleans, or repairs such clothing or equipment of formaldehyde's potentially harmful effects and of procedures to safely handle the clothing and equipment.

(9) Hygiene protection.

(a) The employer shall provide change rooms, as described in WAC 296-24-120 for employees who are required to change from work clothing into protective clothing to prevent skin contact with formaldehyde.

(b) If employees' skin may become splashed with solutions containing one percent or greater formaldehyde, for example because of equipment failure or improper work practices, the employer shall provide conveniently located quick drench showers and assure that affected employees use these facilities

immediately.

(c) If there is any possibility that an employee's eyes may be splashed with solutions containing 0.1 percent or greater formaldehyde, the employer shall provide acceptable eyewash facilities within the immediate work area for emergency use.

(10) Housekeeping. For operations involving formaldehyde liquids or gas, the employer shall conduct a program to detect leaks and spills, including regular visual inspections.

(a) Preventative maintenance of equipment, including surveys for leaks, shall be undertaken at regular intervals.

(b) In work areas where spillage may occur, the employer shall make provisions to contain the spill, to decontaminate the work area, and to dispose of the waste.

(c) The employer shall assure that all leaks are repaired and spills are cleaned promptly by employees wearing suitable protective equipment and trained in proper methods for cleanup and decontamination.

(d) Formaldehyde-contaminated waste and debris resulting from leaks or spills shall be placed for disposal in sealed containers bearing a label warning of formaldehyde's presence and of the hazards associated with formaldehyde.

(11) Emergencies. For each workplace where there is the possibility of an emergency involving formaldehyde, the employer shall assure appropriate procedures are adopted to minimize injury and loss of life. Appropriate procedures shall be implemented in the event of an emergency.

(12) Medical surveillance.

(a) Employees covered.

(i) The employer shall institute medical surveillance programs for all employees exposed to formaldehyde at concentrations at or exceeding the action level or exceeding the STEL.

(ii) The employer shall make medical surveillance available for employees who develop signs and symptoms of overexposure to formaldehyde and for all employees exposed to formaldehyde in emergencies. When determining whether an employee may be experiencing signs and symptoms of possible overexposure to formaldehyde, the employer may rely on the evidence that signs and symptoms associated with formaldehyde exposure will occur only in exceptional circumstances when airborne exposure is less than 0.1 ppm and when formaldehyde is present in materials in concentrations less than 0.1 percent.

(b) Examination by a physician. All medical procedures, including administration of medical disease questionnaires, shall be performed by or under the supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(c) Medical disease questionnaire. The employer shall make the following medical surveillance available to employees prior to assignment to a job where formaldehyde exposure is at or above the action level or above the STEL and annually thereafter. The employer shall also make the following medical surveillance available promptly upon determining that an employee is experiencing signs and symptoms indicative of possible overexposure to formaldehyde.

(i) Administration of a medical disease questionnaire, such as in Appendix D, which is designed to elicit information on work history, smoking history, any evidence of eye, nose, or throat irritation; chronic airway problems or hyperreactive airway disease; allergic skin conditions or dermatitis; and upper or lower respiratory problems.

(ii) A determination by the physician, based on evaluation of the medical disease questionnaire, of whether a medical examination is necessary for employees not required to wear respirators to reduce exposure to formaldehyde.

(d) Medical examinations. Medical examinations shall be given to any employee who the physician feels, based on information in the medical disease questionnaire, may be at increased risk from exposure to formaldehyde and at the time of initial assignment and at least annually thereafter to all employees required to wear a respirator to reduce exposure to formaldehyde. The medical examination shall include:

(i) A physical examination with emphasis on evidence of irritation or sensitization of the skin and respiratory system, shortness of breath, or irritation of the eyes.

(ii) Laboratory examinations for respirator wearers consisting of baseline and annual pulmonary function tests. As a minimum, these tests shall consist of forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and forced expiratory flow (FEF).

(iii) Any other test which the examining physician deems necessary to complete the written opinion.

(iv) Counseling of employees having medical conditions that would be directly or indirectly aggravated by exposure to formaldehyde on the increased risk of impairment of their health.

(e) Examinations for employees exposed in an emergency. The employer shall make medical examinations available as soon as possible to all employees who have been exposed to formaldehyde in an emergency.

(i) The examination shall include a medical and work history with emphasis on any evidence of upper or lower respiratory problems, allergic conditions, skin reaction or hypersensitivity, and any evidence of eye, nose, or throat irritation.

(ii) Other examinations shall consist of those elements considered appropriate by the examining physician.

(f) Information provided to the physician. The employer shall provide the following information to the examining physician:

(i) A copy of this standard and Appendices A, C, D, and E;

(ii) A description of the affected employee's job duties as they relate to the employee's exposure to formaldehyde;

(iii) The representative exposure level for the employee's job assignment;

(iv) Information concerning any personal protective equipment and respiratory protection used or to be used by the employee; and

(v) Information from previous medical examinations of the affected employee within the control of the employer.

(vi) In the event of a nonroutine examination because of an emergency, the employer shall provide to the physician as soon as possible: A description of how the emergency occurred and the exposure the victim may have received.

(g) Physician's written opinion.

(i) For each examination required under this standard, the employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination except that it shall not reveal specific findings or diagnoses unrelated to occupational exposure to formaldehyde. The written opinion shall include:

(A) The physician's opinion as to whether the employee has any medical condition that would place the employee at an increased risk of material impairment of health from exposure to formaldehyde;

(B) Any recommended limitations on the employee's exposure or changes in the use of personal protective equipment, including respirators;

(C) A statement that the employee has been informed by the physician of any medical conditions which would be aggravated by exposure to formaldehyde, whether these conditions may have resulted from past formaldehyde exposure or from exposure in an emergency, and whether there is a need for further examination or treatment.

(ii) The employer shall provide for retention of the results of the

medical examination and tests conducted by the physician.

(iii) The employer shall provide a copy of the physician's written opinion to the affected employee within fifteen days of its receipt.

(h) Medical removal.

(i) The provisions of this subdivision apply when an employee reports significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization attributed to workplace formaldehyde exposure. Medical removal provisions do not apply in case of dermal irritation or dermal sensitization when the product suspected of causing the dermal condition contains less than 0.05% formaldehyde.

(ii) An employee's report of signs or symptoms of possible overexposure to formaldehyde shall be evaluated by a physician selected by the employer pursuant to (c) of this subsection. If the physician determines that a medical examination is not necessary under (c)(ii) of this subsection, there shall be a two-week evaluation and remediation period to permit the employer to ascertain whether the signs or symptoms subside untreated or with the use of creams, gloves, first aid treatment, or personal protective equipment. Industrial hygiene measures that limit the employee's exposure to formaldehyde may also be implemented during this period. The employee shall be referred immediately to a physician prior to expiration of the two-week period if the signs or symptoms worsen. Earnings, seniority, and benefits may not be altered during the two-week period by virtue of the report.

(iii) If the signs or symptoms have not subsided or been remedied by the end of the two-week period, or earlier if signs or symptoms warrant, the employee shall be examined by a physician selected by the employer. The physician shall presume, absent contrary evidence, that observed dermal irritation or dermal sensitization are not attributable to formaldehyde when products to which the affected employee is exposed contain less than 0.1% formaldehyde.

(iv) Medical examinations shall be conducted in compliance with the requirements of (e)(i) and (ii) of this subsection. Additional guidelines for conducting medical exams are contained in WAC 296-62-07546, Appendix C.

(v) If the physician finds that significant irritation of the mucosa of the eyes or the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization result from workplace formaldehyde exposure and recommends restrictions or removal. The employer shall promptly comply with the restrictions or recommendations of removal. In the event of a recommendation of removal, the employer shall remove the affected employee from the current formaldehyde exposure and if possible, transfer the employee to work having no or significantly less exposure to formaldehyde.

(vi) When an employee is removed pursuant to item (v) of this subdivision, the employer shall transfer the employee to comparable work for which the employee is qualified or can be trained in a short period (up to six months), where the formaldehyde exposures are as low as possible, but not higher than the action level. The employer shall maintain the employee's current earnings, seniority, and other benefits. If there is no such work available, the employer shall maintain the employee's current earnings, seniority, and other benefits until such work becomes available, until the employee is determined to be unable to return to workplace formaldehyde exposure, until the employee is determined to be able to return to the original job status, or for six months, whichever comes first.

(vii) The employer shall arrange for a follow-up medical examination to take place within six months after the employee is removed pursuant to this subsection. This examination shall determine if the employee can return to the original job status, or if the removal is to be permanent. The physician shall make a decision within six months of the date the employee was removed as to whether the employee can be returned to the original job status, or if the removal is to be permanent.

(viii) An employer's obligation to provide earnings, seniority, and other benefits to a removed employee may be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program or from employment with another employer made possible by virtue of the employee's removal.

(ix) In making determinations of the formaldehyde content of materials under this subsection the employer may rely on objective data.

(i) Multiple physician review.

(i) After the employer selects the initial physician who conducts any medical examination or consultation to determine whether medical removal or restriction is appropriate, the employee may designate a second physician to review any findings, determinations, or recommendations of the initial physician and to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary and appropriate to evaluate the effects of formaldehyde exposure and to facilitate this review.

(ii) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation for the purpose of medical removal or restriction.

(iii) The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen days after receipt of the notification of the right to seek a second medical opinion, or receipt of the initial physician's written opinion, whichever is later:

(A) The employee informs the employer of the intention to seek a second medical opinion; and

(B) The employee initiates steps to make an appointment with a second physician.

(iv) If the findings, determinations, or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve the disagreement. If the two physicians are unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician who shall be a specialist in the field at issue:

(A) To review the findings, determinations, or recommendations of the prior physicians; and

(B) To conduct such examinations, consultations, laboratory tests, and discussions with prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

(v) In the alternative, the employer and the employee or authorized employee representative may jointly designate such third physician.

(vi) The employer shall act consistent with the findings, determinations, and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(13) Hazard communication.

(a) General. Notwithstanding any exemption granted in WAC 296-800-170 for wood products, each employer who has a workplace covered by this standard shall comply with the requirements of WAC 296-800-170. The definitions of the chemical hazard communication standard shall apply under this standard.

(i) The following shall be subject to the hazard communication requirements of this section: Formaldehyde gas, all mixtures or solutions composed of greater than 0.1 percent formaldehyde, and materials capable of releasing formaldehyde into the air under reasonably foreseeable concentrations reaching or exceeding 0.1 ppm.

(ii) As a minimum, specific health hazards that the employer shall address are: Cancer, irritation and sensitization of the skin and

respiratory system, eye and throat irritation, and acute toxicity.

(b) Manufacturers and importers who produce or import formaldehyde or formaldehyde-containing products shall provide downstream employers using or handling these products with an objective determination through the required labels and MSDSs if these items may constitute a health hazard within the meaning of WAC 296-62-05407 under normal conditions of use.

(c) Labels.

(i) The employer shall assure that hazard warning labels complying with the requirements of WAC 296-800-170 are affixed to all containers of materials listed in (a)(i) of this subsection, except to the extent that (a)(i) of this subsection is inconsistent with this item.

(ii) Information on labels. As a minimum, for all materials listed in (a)(i) of this subsection, capable of releasing formaldehyde at levels of 0.1 ppm to 0.5 ppm, labels shall identify that the product contains formaldehyde: List the name and address of the responsible party; and state that physical and health hazard information is readily available from the employer and from material safety data sheets.

(iii) For materials listed in (a)(i) of this subsection, capable of releasing formaldehyde at levels above 0.5 ppm, labels shall appropriately address all the hazards as defined in WAC 296-800-170, and Appendices A and B, including respiratory sensitization, and shall contain the words "Potential Cancer Hazard."

(iv) In making the determinations of anticipated levels of formaldehyde release, the employer may rely on objective data indicating the extent of potential formaldehyde release under reasonably foreseeable conditions of use.

(v) Substitute warning labels. The employer may use warning labels required by other statutes, regulations, or ordinances which impart the same information as the warning statements required by this subitem.

(d) Material safety data sheets.

(i) Any employer who uses formaldehyde-containing materials listed in (a)(i) of this subsection shall comply with the requirements of WAC 296-800-170 with regard to the development and updating of material safety data sheets.

(ii) Manufacturers, importers, and distributors of formaldehyde containing materials listed in (a)(i) of this subsection shall assure that material safety data sheets and updated information are provided to all employers purchasing such materials at the time of the initial shipment and at the time of the first shipment after a material safety data sheet is updated.

(e) Written hazard communication program. The employer shall develop, implement, and maintain at the workplace, a written hazard communication program for formaldehyde exposures in the workplace, which at a minimum describes how the requirements specified in this section for labels and other forms of warning and material safety data sheets, and subsection (14) of this section for employee information and training, will be met. Employees in multi-employer workplaces shall comply with the requirements of WAC 296-800-170.

(14) Employee information and training.

(a) Participation. The employer shall assure that all employees who are assigned to workplaces where there is a health hazard from formaldehyde participate in a training program, except that where the employer can show, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm, the employer is not required to provide training.

(b) Frequency. Employers shall provide such information and training to employees at the time of their initial assignment and whenever a new exposure to formaldehyde is introduced into their work area. The training shall be repeated at least annually.

(c) Training program. The training program shall be conducted in a

manner which the employee is able to understand and shall include:

- (i) A discussion of the contents of this regulation and the contents of the material safety data sheet;

- (ii) The purpose for and a description of the medical surveillance program required by this standard, including:

- (A) A description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde.

- (B) Instructions to immediately report to the employer the development of any adverse signs or symptoms that the employee suspects is attributable to formaldehyde exposure.

- (iii) Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure to formaldehyde in each job;

- (iv) The purpose for, proper use of, and limitations of personal protective clothing;

- (v) Instructions for the handling of spills, emergencies, and clean-up procedures;

- (vi) An explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls;

- (vii) A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency; and

- (viii) The purpose, proper use, limitations, and other training requirements for respiratory protection as required by chapter 296-62 WAC, Part E.

- (d) Access to training materials.

- (i) The employer shall inform all affected employees of the location of written training materials and shall make these materials readily available, without cost, to the affected employees.

- (ii) The employer shall provide, upon request, all training materials relating to the employee training program to the director of labor and industries, or his/her designated representative.

- (15) Recordkeeping.

- (a) Exposure measurements. The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to formaldehyde. This record shall include:

- (i) The date of measurement;

- (ii) The operation being monitored;

- (iii) The methods of sampling and analysis and evidence of their accuracy and precision;

- (iv) The number, durations, time, and results of samples taken;

- (v) The types of protective devices worn; and

- (vi) The names, job classifications, Social Security numbers, and exposure estimates of the employees whose exposures are represented by the actual monitoring results.

- (b) Exposure determinations. Where the employer has determined that no monitoring is required under this standard, the employer shall maintain a record of the objective data relied upon to support the determination that no employee is exposed to formaldehyde at or above the action level.

- (c) Medical surveillance. The employer shall establish and maintain an accurate record for each employee subject to medical surveillance under this standard. This record shall include:

- (i) The name and Social Security number of the employee;

- (ii) The physician's written opinion;

- (iii) A list of any employee health complaints that may be related to exposure to formaldehyde; and

- (iv) A copy of the medical examination results, including medical disease questionnaires and results of any medical tests required by the

standard or mandated by the examining physician.

(d) Record retention. The employer shall retain records required by this standard for at least the following periods:

(i) Exposure records and determinations shall be kept for at least thirty years; and

(ii) Medical records shall be kept for the duration of employment plus thirty years.

(e) Availability of records.

(i) Upon request, the employer shall make all records maintained as a requirement of this standard available for examination and copying to the director of labor and industries, or his/her designated representative.

(ii) The employer shall make employee exposure records, including estimates made from representative monitoring and available upon request for examination and copying, to the subject employee, or former employee, and employee representatives in accordance with WAC 296-62-052 through 296-62-05209 and 296-62-05213 through 296-62-05217 and WAC 296-800-180.

(iii) Employee medical records required by this standard shall be provided upon request for examination and copying, to the subject employee, or former employee, or to anyone having the specific written consent of the subject employee or former employee in accordance with WAC 296-62-05201 through 296-62-05209, and 296-62-05213 through 296-62-05217.

AMENDATORY SECTION (Amending WSR 99-22-046, filed 10/29/99, effective 2/1/00)

**WAC 296-62-14105 Definitions.** "Acceptable entry conditions" means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

"Attendant" means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

"Authorized entrant" means an employee who is authorized by the employer to enter a permit space.

"Blanking or blinding" means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore. It is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

"Confined space" means a space that:

☛ Is large enough and so configured that an employee can bodily enter and perform assigned work; and

☛ Has limited or restricted means for entry or exit (For example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and

☛ Is not designed for continuous employee occupancy.

"Double block and bleed" means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

"Emergency" means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

"Engulfment" means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be inhaled to cause death by filling or plugging the respiratory system or that can exert

enough force on the body to cause death by strangulation, constriction, or crushing.

**"Entry"** means the action by which a person passes through an opening into a permit-required confined space and includes work activities in that space. Entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Note: If the opening is large enough for the worker to fully enter the space a permit is required even for partial body entry. Permits are not required for partial body entry where the opening is not large enough for full entry, although other standards such as lockout-tagout or respiratory protection may apply.

**"Entry permit (permit)"** means the written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in WAC ((~~296-62-14509~~)) 296-62-14125.

**"Entry supervisor"** means the person (such as the employer, crew leader, or crew chief) responsible for:

- ☛ Determining if acceptable entry conditions are present at a permit space where entry is planned;
- ☛ Authorizing entry and overseeing entry operations; and
- ☛ Terminating entry as required by this part.

Note: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

**"Hazardous atmosphere"** means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- ☛ Flammable gas, vapor, or mist in excess of ten percent of its lower flammable limit (LFL);
- ☛ Airborne combustible dust at a concentration that meets or exceeds its LFL;

Note: This concentration may be approximated as a condition in which the dust obscures vision at a distance of five feet (1.52 m) or less.

☛ Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

☛ Atmospheric concentration of any substance which may exceed a permissible exposure limit is published in chapter 296-62 WAC, Parts F, G, H, and I, general occupational health standards;

Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

☛ Any other atmospheric condition that is immediately dangerous to life or health.

Note: For air contaminants for which WISHA has not determined a dose or permissible exposure limit, other sources of information, such as material safety data sheets that comply with the Hazard Communication Standard, chapter 296-62 WAC, Part C, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

**"Hot work permit"** means the employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

**"Immediately dangerous to life or health (IDLH)"** means any condition that:

- ☛ Poses an immediate or delayed threat to life; or
- ☛ Would cause irreversible adverse health effects; or
- ☛ Would interfere with an individual's ability to escape unaided from a permit space.

Note: Some materials - hydrogen fluoride gas and cadmium vapor, for example - may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials

in hazardous quantities are considered to be "immediately" dangerous to life or health.

**"Inerting"** means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Note: This procedure produces an IDLH oxygen-deficient atmosphere.

**"Isolation"** means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: Blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

**"Line breaking"** means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

**"Nonpermit confined space"** means a confined space that does not contain any physical hazards or any actual or potential atmospheric hazards capable of causing death or serious physical harm.

**"Oxygen deficient atmosphere"** means an atmosphere containing less than 19.5 percent oxygen by volume.

**"Oxygen enriched atmosphere"** means an atmosphere containing more than 23.5 percent oxygen by volume.

**"Permit-required confined space (permit space)"** means a confined space that has one or more of the following characteristics:

- ⌘ Contains or has a potential to contain a hazardous atmosphere;
- ⌘ Contains a material that has the potential for engulfing an entrant;
- ⌘ Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- ⌘ Contains any other recognized serious safety or health hazard.

**"Permit-required confined space program (permit space program)"** means the employer's overall program for:

- ⌘ Controlling, and, where appropriate, for protecting employees from, permit space hazards; and
- ⌘ Regulating employee entry into permit spaces.

**"Permit system"** means the employer's written procedure for:

- ⌘ Preparing and issuing permits for entry; and
- ⌘ Returning the permit space to service following termination of entry.

**"Prohibited condition"** means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

**"Rescue service"** means the personnel designated to rescue employees from permit spaces.

**"Retrieval system"** means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for nonentry rescue of persons from permit spaces.

**"Testing"** means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

Note: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

AMENDATORY SECTION (Amending WSR 99-22-046, filed 10/29/99, effective 2/1/00)

**WAC 296-62-14110 General requirements.** (1) The employer must evaluate the workplace to determine if confined spaces are present. A confined space must be assumed to be a permit-required space unless it can be documented to be a nonpermit-confined space as required in subsection (2) of this section.

Note: Proper application of the decision flow chart in WAC 296-62-14171, Appendix A, would facilitate compliance with this requirement.

(2) A confined space may be classified as a nonpermit-confined space under the following conditions and procedures:

(a) If the confined space poses no actual or potential atmospheric hazards.

(b) If the confined space has no other recognized health or safety hazards including engulfment in solid or liquid material, electrical shock, or moving parts.

(c) If all hazards within the space are eliminated without entry into the space, the confined space may be classified as a nonpermit confined space for as long as the hazards remain eliminated.

(d) If it is necessary to enter the confined space to eliminate hazards, it must be assumed to be a permit space and such entry must be performed under WAC 296-62-14115 through 296-62-14150. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a nonpermit confined space for as long as the hazards remain eliminated.

Note: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. Subsections (6) and (7) of this section cover permit space entry where the employer can demonstrate that forced air ventilation alone will control all hazards in the space.

(e) The employer must:

(i) Document that all hazards in a permit space have been eliminated, through a certification that contains the date, the location of the space, and the signature of the person making the determination.

(ii) Make the certification available to each employee entering the space or to that employee's authorized representative.

(f) When there are changes in the use or configuration of a nonpermit confined space that might increase the hazards to entrants, the employer must reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

(g) If hazards arise within a confined space that has been classified as a nonpermit space under this subsection, each employee in the space must exit the space. The employer must then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with chapter 296-62 WAC, Part M.

(3) If the workplace contains permit-required confined spaces, the employer must inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the permit spaces.

Note: A sign reading "DANGER-PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" or using other similar language would satisfy the requirement for a sign.

(4) If the employer decides that its employees will not enter permit spaces, the employer must:

☛ Take effective measures to prevent its employees from entering the permit spaces; and

☛ Comply with subsections (1), (3), and (8) of this section.

(5) If the employer decides that its employees will enter permit spaces, the employer must:

(a) Follow the procedures outlined in WAC 296-62-14115 through 296-62-14155; and

(b) Develop and implement a written permit space program that complies with this part; and

(c) Make the written program available for inspection by employees and their authorized representatives.

(6) An employer may use the alternate entry procedures specified in subsection (7) of this section for entering a permit space under the following conditions:

(a) The employer can demonstrate that the only hazard posed by the permit space is an actual or potential hazardous atmosphere;

(b) The employer can demonstrate that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry;

(c) The employer develops or has monitoring and inspection data that supports the demonstrations required by (a) and (b) of this subsection;

(d) If an initial entry of the permit space is necessary to obtain the data required by (c) of this subsection, the entry must be performed in compliance with the permit required confined space procedures outlined in WAC 296-62-14115 through 296-62-14150; and

(e) The determinations and supporting data required by (a), (b), and (c) of this subsection are documented by the employer and are made available to each employee who enters the permit space or to that employee's authorized representative.

(7) Alternate procedures for entering permit confined spaces.

The following alternate procedures apply to entry into permit spaces that meet the conditions set forth in subsection (6) of this section.

(a) During permit space entry using these alternate procedures an employer need not comply with WAC 296-62-14115 through 296-62-14125 and WAC 296-62-14135 through 296-62-14150. Training and employee participation requirements of WAC 296-62-14130 and 296-62-14155 still apply.

(b) Any conditions making it unsafe to remove an entrance cover must be eliminated before the cover is removed.

(c) When entrance covers are removed, the opening must be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and will protect each employee working in the confined space from objects falling into the space.

(d) Before an employee enters the confined space, the internal atmosphere must be tested, with a calibrated direct-reading instrument, for the following conditions in the order given below:

Any employee who enters the space, or that employee's authorized representative, must be provided an opportunity to observe the preentry testing required by this ~~((paragraph))~~ subdivision.

(i) Oxygen content,

(ii) Flammable gases and vapors, and

(iii) Potential toxic air contaminants.

(e) There must be no hazardous atmosphere within the space whenever any employee is inside the space.

(f) Continuous forced air ventilation must be used, as follows:

(i) An employee must not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;

(ii) The forced air ventilation must:

☛ Be directed to ventilate the immediate areas where an employee is or will be present within the space; and

☛ Continue until all employees have left the space;

(iii) The air supply for the forced air ventilation must be from a clean source and may not increase the hazards in the space.

(g) The atmosphere within the space must be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. Any employee who enters the space, or that employee's authorized representative, shall be provided with an opportunity to observe the periodic testing required by this subsection.

(h) If a hazardous atmosphere is detected during entry:

(i) Each employee must leave the space immediately;

(ii) The space must be evaluated to determine how the hazardous atmosphere developed; and

(iii) Measures must be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

(i) The employer must verify that:

☛ The space is safe for entry; and

☛ The preentry measures required by (a), (b), and (c) of this subsection have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification is made before entry and available to each employee entering the space.

(8) When an employer (host employer) arranges to have employees of another employer (contractor) perform work that involves permit space entry, the host employer must:

(a) Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements of this standard;

(b) Inform the contractor of the hazards identified and the host employer's experience with each permit space to be entered;

(c) Inform the contractor of any precautions or procedures that the host employer requires for the protection of employees in or near permit spaces where contractor personnel will be working;

(d) Coordinate entry operations with the contractor, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by WAC 296-62-14115(11); and

(e) Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

(9) In addition to complying with the permit space requirements that apply to all employers, each contractor who is retained to perform permit space entry operations must:

(a) Obtain any available information regarding permit space hazards and entry operations from the host employer;

(b) Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by WAC 296-62-14115(11); and

(c) Inform the host employer either through a debriefing or during the entry operation of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces.

AMENDATORY SECTION (Amending WSR 99-22-046, filed 10/29/99, effective 2/1/00)

**WAC 296-62-14155 Employee participation.** (1) Employers must consult with affected employees and their authorized representatives on the development and implementation of all aspects of the permit space program required by WAC ((~~296-62-14503~~)) 296-62-14110.

(2) Employers must make available to affected employees and their

authorized representatives all information required to be developed by this part.

AMENDATORY SECTION (Amending WSR 99-22-046, filed 10/29/99, effective 2/1/00)

**WAC 296-62-14171 Appendix A--Permit-required confined space decision flow chart.**

(WAC 296-62-14171, Illus. 1) Place illustration here.

~~((WAC 296-62-14171, Illus. 2) Place illustration here.~~

~~(WAC 296-62-14171, Illus. 3) Place illustration here.)~~

Place illustration here.

Place illustration here.

AMENDATORY SECTION (Amending Order 90-18, filed 1/10/91, effective 2/12/91)

**WAC 296-62-07314 Medical surveillance.** (1) At no cost to the employee, a program of medical surveillance (~~((shall))~~) must be established and implemented for employees considered for assignment to enter regulated areas, and for authorized employees.

(2) Examinations.

(a) Before an employee is assigned to enter a regulated area, a preassignment physical examination by a physician (~~((shall))~~) must be provided and (~~((shall))~~) must include a personal history of the employee and/or his/her family and (~~((occupation))~~) occupational background, including genetic and environmental factors.

(i) Taking of employees' medical history and background history (~~((shall))~~) must be considered to be a routine part of standard medical practice.

(ii) This provision does not require "genetic testing" of any employee.

(iii) This provision does not require the exclusion of otherwise qualified employees from jobs on the basis of genetic factors.

(b) Authorized employees (~~((shall))~~) must be provided periodic physical examination, not less often than annually, following the preassignment examination.

(c) In all physical examinations, the examining physician (~~((shall))~~) must be requested to consider whether there exist conditions of increased risk, including reduced immunological competence, (~~((those undergoing treatment with steroids or cytotoxic agents,))~~) pregnancy (~~((and))~~), cigarette smoking, and those undergoing treatment with steroids or cytotoxic agents.

(3) Records.

(a) Employers of employees examined pursuant to this subdivision (~~((shall cause to be maintained))~~) must maintain complete and accurate records of all such medical examinations. Records (~~((shall))~~) must be maintained for the duration of the employee's employment. Upon termination of the employee's employment, including retirement or death, or in the event that the employer ceases business without a successor, records, or notarized true copies thereof, (~~((shall))~~) must be forwarded by registered mail to the director.

(b) Records required by this section (~~((shall))~~) must be provided upon request to employees, designated representatives, and the director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217. (~~((These records shall also be provided upon request to the director.))~~)

(c) Any employer who requests a physical examination of (~~((one of his))~~) an employee((s)) or prospective employee(~~((s))~~) as required by this section (~~((shall))~~) must obtain from the physician a statement of the employee's suitability for employment in the specific exposure.

AMENDATORY SECTION (Amending WSR 99-16-083, filed 8/3/99, effective 11/3/99)

**WAC 296-79-140 Installation, inspection, and maintenance of pipes, piping systems, and hoses.** (1) Definitions applicable to this section.

"Hazardous material system" - any system within the following classifications:

- ☛ Flammable or explosive - any system containing materials which are hazardous because they are easily ignited and create a fire or explosion hazard, defined by NFPA as Class I liquids;

- ☛ Chemically active or toxic - any system containing material which offers corrosion or toxic hazard in itself or can be productive of harmful gases upon release, defined by NFPA 704M as Class 3 and 4 materials;

- ☛ Thermally hazardous - any system above 130°F which exposes persons to potential thermal burns;

- ☛ Pressurized - any gaseous system above 200 psig or liquid system above 500 psig.

"Piping system" - any fixed piping, either rigid pipe or flexible hose, including all fittings and valves, in either permanent or temporary application.

(2) Design and installation. All new piping systems intended to be used in hazardous material service must be designed and installed in accordance with applicable provisions of the ASME Code for Pressure Piping or in accordance with applicable provisions of ANSI B31.1-1995 through B31.8-1995.

(3) Inspection and maintenance.

(a) The employer must develop a formal program of installation inspections and maintenance for all hazardous material piping systems. The program must be:

- ☛ Based on sound maintenance engineering principle, and

- ☛ Demonstrate due consideration for the manufacturing specifications of the pipe, hose, valves and fittings, the ambient environment of the installation and the corrosive or abrasive effect of the material handled within the system.

(b) Type and frequency of tests and/or inspections and selection of inspection sites must be adequate to give indications that minimum safe design operating tolerances are maintained. The tests may include visual or nondestructive methods.

(4) Inspection records.

(a) Results of inspections and/or tests must be maintained as a record for each system. Portions of systems that are buried or enclosed in permanent structures in such a manner as to prevent exposure to employees even in the event of a failure, may be exempted from the inspection requirements only.

- ☛ Past records may be discarded provided the current inspection report and the immediately preceding two reports are maintained.

- ☛ When a system is replaced, a new record must be established and all past records may be discarded.

(b) Upon request the records for each system must be made available for review by the department of labor and industries.

(5) Systems or sections of systems found to be below the minimum design criteria requirements for the current service must be repaired or replaced with component parts and methods which equal the requirements for new installations.

(6) Identification of piping systems.

(a) (~~((Pipes containing hazardous materials must be identified. It is recommended that))~~) USAS A13.1-1956, "Scheme for Identification of Piping Systems," must be followed.

Positive identification of a piping system content:

☛ Must have a lettered legend giving the name of the content in full or abbreviated form, or a commonly used identification system.

☛ Must be made and maintained at suitable intervals and at valves, fittings, and on both sides of walls or floors as needed.

☛ May have arrows to indicate the direction of flow.

☛ May provide necessary supplementary information such as hazard of use. This may be done by additional legend or by color applied to the entire piping system or as colored bands. Legends may be placed on colored bands.

Examples of legend which may give both positive identification and supplementary information regarding hazards or use are:

Ammonia ..... Hazardous liquid or gas

Chlorine ..... Hazardous liquid or gas

Chlorine dioxide ..... Hazardous liquid or gas

Sulphur dioxide ..... Hazardous gas

Liquid caustic ..... Hazardous liquid

Liquid sulphur ..... Hazardous liquid

Sulphuric acid ..... Hazardous liquid

Sodium chlorate ..... When dry, danger of fire or  
explosion

Note: Manual L-1, published by Chemical Manufacturers Association,  
Inc., is a valuable guide  
in respect to  
supplementary legend.

☛ When color, applied to the entire piping system or as colored bands, is used to give supplementary information it should conform to the following:

CLASSIFICATION	PREDOMINANT COLOR
F--Fire-protection equipment .....	Red
...	
D--Dangerous materials .....	Yellow
...	
	(or orange)
S--Safe materials .....	Green
...	
	(or the achromatic colors, white, black, gray or aluminum)

and, when required,

P--Protective materials .....	Bright blue
....	

(b) When legend systems are used, legend boards showing the color and identification scheme in use must be prominently displayed at each plant.

They must be located so that employees who may be exposed to hazardous material piping systems will have a frequent reminder of the identification program.

(c) All employees who work in the area of hazardous material piping systems must be given training in the color and identification scheme in use.

(7) Steam hoses. Steam hoses must be specifically designed to safely carry steam at any pressures to which they may be subjected.

AMENDATORY SECTION (Amending WSR 00-14-058, filed 7/3/00, effective 10/1/00)

**WAC 296-155-24525 Appendix B to Part C-1--Fall restraint and fall arrest (employer information only).** Additional standards that require the use of fall restraint and/or fall arrest protection for employees are listed below:

Ladders	WAC 296-155-480 (1)(r)
	WAC 296-155-480 (1)(s)
Scaffolds	WAC 296-155-483(7)
Boom Supported Elevating Work Platforms	WAC 296-155-489
Vehicle Mounted Elevated and Rotating Work Platforms	WAC 296-155-490 (2)(b)(v)
Crane and Derrick Supported Work Platforms	WAC 296-155-528 (6)(c)
	WAC 296-155-528 (6)(d)
	WAC 296-155-528 (7)(i)
	WAC 296-155-528 (7)(j)
	WAC 296-155-528 (7)(k)
	WAC 296-155-528 (10)(h)
Open Sided Floors	WAC 296-155-505 (6)(a) through (f)
Pile Driving	WAC 296-155-620 (1)(i)
Vertical Slip Forms	WAC 296-155-688(9)
Placing and Removal of Forms	WAC 296-155-689(4)
Steel Erection Temporary Floors	WAC 296-155-705 (2)(b)
<del>((Tunneling (Skips and Platforms))</del>	<del>WAC 296-155-730 (8)(e))</del>

AMENDATORY SECTION (Amending Order 88-04, filed 5/11/88)

**WAC 296-155-441 Applicability.** (1) Covered. WAC 296-155-441 through 296-155-459 contain installation safety requirements for electrical equipment and installations used to provide electric power and light at the jobsite. These sections apply to installations, both temporary and permanent, used on the jobsite; but these sections do not apply to existing permanent installations that were in place before the construction activity commenced.

Note: If the electrical installation is made in accordance with the National Electrical Code ANSI/NFPA 70-1984, exclusive of formal

interpretations and tentative interim amendments, it will be deemed to be in compliance with WAC 296-155-444 through 296-155-459, except for WAC 296-155-447 (2)(a) and 296-155-449 (1)(b)(ii)(E), (F), (G), and (J).

(2) Not covered. WAC 296-155-441 through 296-155-459 do not cover installations used for the generation, transmission, and distribution of electric energy, including related communication, metering, control, and transformation installations. (However, these regulations do cover portable and vehicle-mounted generators used to provide power for equipment used at the jobsite.) See (~~chapter 296-44 WAC, Safety standards--Electrical Construction Code, for the construction of power distribution and transmission lines~~) the National Electrical Safety Code (NESC).

AMENDATORY SECTION (Amending WSR 01-17-033, filed 8/8/01, effective 9/1/01)

**WAC 296-155-525 Cranes and derricks.** (1) Definitions applicable to this part:

**Accessory** - a secondary part or assembly of parts which contributes to the overall function and usefulness of a machine.

**Administrative or regulatory authority** - a governmental agency, or the employer in the absence of governmental jurisdiction.

**Angle indicator (boom)** - an accessory which measures the angle of the boom to the horizontal.

**Appointed** - assigned specific responsibilities by the employer or the employer's representative.

**Authorized person** - means a person approved or assigned by the employer to perform a specific type of duty or duties or be at a specific location or locations at the workplace.

**Auxiliary hoist** - a secondary hoist rope system used either in conjunction with, or independently of, the main hoist system.

**Axis of rotation** - the vertical axis around which the crane superstructure rotates.

**Axle** - the shaft or spindle with which or about which a wheel rotates. On wheel-mounted cranes it refers to a type of axle assembly including housings, gearing, differential, bearings, and mounting appurtenances.

**Axle (bogie)** - two or more axles mounted in tandem in a frame so as to divide the load between the axles and permit vertical oscillation of the wheels.

**Ballast** - weight used to supplement the weight of the machine in providing stability for lifting working loads (the term **ballast** is normally associated with locomotive cranes).

**Base, anchor bolt** - a crane base that is bolted to a footing.

**Base, expendable** - for static-mounting cranes, a style of bottom mast section or member that is cast into a concrete footing block; all or part of this component is lost to future installations.

**Base, fixed** - a crane base that does not travel. It may be expendable, knee braced, or anchor bolted.

**Base (mounting)** - the traveling base on which the rotating superstructure of a locomotive or crawler crane is mounted.

**Base, tower crane** - the lowermost supporting component of the crane.

**Base, travel** - a crane base that is a ballasted platform mounted on trucks that ride along rails.

**Boom (crane)** - a member hinged at the rotating superstructure and used for supporting the existing tackle.

**Boom angle** - the angle above or below horizontal of the longitudinal axis of the base boom section.

**Boom hoist mechanism** - means for supporting the boom and controlling the boom angle.

**Boom point** - the outer extremity of the crane boom, containing the hoist sheave assembly.

**Boom point sheave assembly** - an assembly of sheaves and pin built as an integral part of the boom point.

**Boom stop** - a device used to limit the angle of the boom at the highest recommended position.

**Brake** - a device used for retarding or stopping motion.

**Brace, tower** - a structural attachment placed between a crane tower and an adjacent structure to pass loads to the adjacent structure and permit the crane to be erected to greater than free standing height.

**Buffer** - an energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel.

**Cab** - a housing which covers the rotating superstructure machinery, or the operator's or driver's station.

**Climbing frame** - a frame used with climbing cranes to transmit operational and climbing reactions to the host building frame.

**Climbing ladder** - a steel member with crossbars (used in parts) suspended from a climbing frame and used as jacking support points when some cranes climb.

**Clutch** - a means for engagement or disengagement of power.

**Commercial truck vehicle** - a commercial motor vehicle designed primarily for the transportation of property in connection with business and industry.

**Counterweight** - weight used to supplement the weight of the machine in providing stability for lifting working loads.

**Counterweight jib** - a horizontal member of a crane on which the counterweights and usually the hoisting machinery are mounted.

**Crane carrier** - the undercarriage of a wheel-mounted crane specifically designed for transporting the rotating crane superstructure. It may or may not provide its own travel mechanism. It is distinguished from a commercial truck vehicle in that it is not designed to transport personnel, materials, or equipment other than the crane-rotating superstructure.

**Cross-over points** - in multiple layer spooling of rope on a drum, those points of rope contact where the rope crosses the preceding rope layer.

**Designated-** selected or assigned by the employer or the employer's representative as being competent to perform specific duties.

**Drum** - the cylindrical member around which a rope is wound for lifting and lowering the load or boom.

**Dynamic (loading)** - loads introduced into the machine or its components due to accelerating or decelerating forces.

**Flange point** - a point of contact between rope and drum flange where the rope changes layers.

**Free standing height** - that height of a crane which is supported by the tower (mast) alone without assistance from braces, guys, or other means.

**Gage, track** - the horizontal distance between two rails measured perpendicular to the direction of travel.

**Gantry (A-frame)** - a structural frame, extending above the superstructure, to which the boom support ropes are reeved.

**High strength (traction) bolts** - high strength tensile bolts used in the assembly of crane sections. The bolts are installed in tension by torquing or other means at a level greater than that produced by in- or out-of-service loads for the purpose of reducing the likelihood of bolt fatigue failure.

**Hoist mechanism** - a hoist drum and rope reeving system used for lifting and lowering loads.

**Jib** - an extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or

offset to various angles in the vertical plane of the boom.

**Jib backstop** - a device which will restrain the jib from turning over backward.

**Job site** - work area defined by the construction contract.

**Limiting device** - a mechanical device which is operated by some part of a power driven machine or equipment to control loads or motions of the machine or equipment.

**Load (working)** - the external load in pounds (kilograms) applied to the crane, including the weight of load-attaching equipment such as lower load block, shackles, and slings.

**Load block, lower** - the assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.

**Load block, upper** - the assembly of shackle, swivel, sheaves, pins, and frame suspended from the boom point.

**Load ratings** - crane ratings in pounds (kilograms) established by the manufacturer.

**Mast (boom)** - a frame hinged at or near the boom hinge for use in connection with supporting a boom. The head of the mast is usually supported and raised or lowered by the boom hoist ropes.

**Mast (jib)** - a frame hinged at or near the boom point for use in connection with supporting a jib.

**Normal operating conditions.**

**Cab- or station-operated cranes** - conditions during which a crane is performing functions within the manufacturer's operating recommendations. Under these conditions, the operator is at the operating control devices on the crane, and no other persons except those appointed are to be on the crane.

**Ground- or floor-operated cranes** - conditions during which a crane is performing functions within the manufacturer's operating recommendations. Under these conditions, the operator is at the operating control devices that are mounted to the crane but operated with the operator off the crane, and no other persons except those appointed are to be on the crane.

**Remote-operated cranes** - conditions during which a crane is performing functions within the manufacturer's operating recommendations. Under these conditions, the operator is at the operating control devices that are mounted to any part of the crane, and no other persons except those appointed are to be on the crane.

**Out-of-service** - the condition of a crane when unloaded, without power and with the controls unattended and prepared to endure winds above the in-service level.

**Outriggers** - extendable or fixed members attached to the mounting base, which rest on supports at the outer ends used to support the crane.

**Pawl (dog)** - a device for positively holding a member against motion in one or more directions.

**Payload** - that load or loads being transported by the commercial truck chassis from place to place.

**Pendant** - a rope or strand of specified length with fixed end connections.

**Pitch diameter** - the diameter of a sheave or rope drum measured at the center line of the rope.

**Power-controlled lowering** - a system or device in the power train, other than the load hoist brake, which can control the lowering rate of speed of the load hoist mechanism.

**Qualified person** - a person who, by possession of a recognized degree or certificate of professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

**Radius (load)** - the horizontal distance from a projection of the axis of rotation to the base of the crane, before loading, to the center of the

vertical hoist line or tackle with load applied.

**Rail clamp** - a tong-like metal device mounted on a locomotive crane car, which can be connected to the track.

**Reeving** - a rope system in which the rope travels around drums and sheaves.

**Remote control station** - a location, not on the crane, from which the operator can control all the crane movements.

**Repetitive pickup point** - when operating on a short cycle operation, the rope being used on a single layer and being spooled repetitively over a short portion of the drum.

**Rope** - refers to wire rope unless otherwise specified.

**Rotation resistant rope** - a wire rope consisting of an inner layer of strand laid in one direction covered by a layer of strand laid in the opposite direction. This has the effect of counteracting torque by reducing the tendency of the finished rope to rotate.

**Running rope** - a rope which travels around sheaves or drums.

**Shall** - this word indicates that the rule is mandatory and must be followed.

**Service, light** - service that involves irregular operation with loads generally about one-half or less of the rated load; a service crane at a storage yard or building site would be an example.

**Service, normal** - service that involves operating occasionally at rated load but normally at less than eighty-five percent of the rated load and not more than ten lift cycles per hour except for isolated instances; a crane used for concrete placement at a building site would be an example.

**Service, heavy** - service that involves operating at eighty-five percent to one hundred percent of the rated load or in excess of ten lift cycles per hour as a regular specified procedure; some cranes operating at material yards or in industrial applications may fall into this category.

**Sheave** - a grooved wheel or pulley used with a rope to change the direction and point of application of a pulling force.

**Should** - this word indicates that the rule is a recommendation, the advisability of which depends on the facts in each situation.

**Side loading** - a load applied to an angle to the vertical plane of the boom.

**Stabilizer** - stabilizers are extendable or fixed members attached to the mounting base to increase the stability of the crane, but which may not have the capability of relieving all of the weight from wheels or tracks.

**Standby crane** - a crane which is not in regular service but which is used occasionally or intermittently as required.

**Standing (guy) rope** - a supporting rope which maintains a constant distance between the points of attachment to the two components connected by the rope.

**Structural competence** - the ability of the machine and its components to withstand the stresses imposed by applied loads.

**Superstructure** - the rotating upper frame structure of the machine and the operating machinery mounted thereon.

**Swing** - rotation of the superstructure for movement of loads in a horizontal direction about the axis of rotation.

**Swing mechanism** - the machinery involved in providing rotation of the superstructure.

**Swivel** - a load carrying member with thrust bearings to permit rotation under load in a plane perpendicular to the direction of the load.

**Swiveling** - the rotation of the load attachment portion (hook or shackle) of a load block (lower) or hook assembly about its axis of suspension in relation to the load line(s).

**Tackle** - an assembly of ropes and sheaves arranged for lifting, lowering, or pulling.

**Telescoping boom** - consists of a base boom from which one or more boom

sections are telescoped for additional length.

**Telescoping (tower crane)** - a process whereby the height of a traveling or fixed base crane is increased typically by raising the inner tower and then adding sections at the top of the outer tower; there are also cranes that are telescoped by adding to the inner tower from below.

**Tower (mast)** - a vertical structural frame consisting of columns and bracing capable of supporting an upperstructure with its working and dynamic loads and transmitting them to the supporting surface or structure.

**Traction (high strength) bolts** - see high strength bolts.

**Transit** - the moving or transporting of a crane from one job site to another.

**Travel** - the function of the machine moving under its own power from one location to another on a job site.

**Trolley** - the device that travels along the load jib and contains the upper load block.

**Two-blocking** - the condition in which the lower load block or hook assembly comes in contact with the upper load block or boom point sheave assembly.

**Weathervaning** - wind induced rotation of a crane upperstructure, when out-of-service, to expose minimal surface area to the wind.

**Wedge** - a tapered wood or steel device used to provide stability to cranes during use as a climber. When the wedges are tightened against the four main legs of the tower, they convert overturning moments into horizontal forces to be resisted by the floor framing or slab.

**Wheel base** - the distance between centers of front and rear axles. For a multiple axle assembly the axle center for wheel base measurement is taken as the midpoint of the assembly.

**Whipline (runner or auxiliary)** - a secondary rope system usually of lighter load capacity than that provided by the main rope system.

**Winch head** - a power driven spool for handling of loads by means of friction between fiber or wire rope and the spool.

(2) General requirements.

(a) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available the limitations assigned to the equipment shall be based on the determinations of a qualified engineer, competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.

(b) Rated load capacities, and recommended operating speeds, and special hazard warnings, or instruction, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while at the control station.

(c) Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site.

(d) The employer shall designate a competent person who shall inspect all machinery and equipment prior to each use, and periodically during use to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use.

(e) A thorough, annual inspection of the hoisting machinery shall be made by a competent person, or by a government or private agency recognized by the department. The employer shall maintain a permanent record of the dates and results of all inspections for each hoisting machine and piece of equipment.

(f) A tag line or guide rope shall be used on all loads that swing freely. Guide ropes or tag lines shall be held by experienced persons.

(g) Care shall be taken to guard against injury to workers, or damage to scaffolds or buildings, from swinging loads.

- (h) The operator shall avoid carrying loads over people.
  - (i) When work is stopped or when the derrick is not in operation, the boom shall be lowered to a horizontal position or tied in place to prevent it whipping with the wind or other external force.
  - (j) Only authorized personnel shall make sling hitches on loads.
  - (k) Workers shall not be allowed to ride on loads handled by derricks.
  - (l) Operators shall observe signals only from duly authorized persons. Under no circumstances shall a load be moved until the signal is received from authorized personnel.
  - (m) Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard. Guarding shall meet the requirements of chapter 296-24 WAC.
  - (n) A minimum distance of thirty inches clearance shall be maintained between the swing radius of the greatest extension of the crane superstructure or counterweights and a stationary object, including the crane itself, while the crane is in operation. When this clearance cannot be maintained, suitable barricades or safeguards shall be used to isolate the pinch point hazard area.
  - (o) All exhaust pipes shall be guarded or insulated where contact by employees, in the performance of normal duties, is possible.
- (3) Additional requirements.
- (a) Whenever internal combustion engine powered equipment exhausts in enclosed spaces, tests shall be made and recorded to see that employees are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres. (See chapter 296-62 WAC, the general occupational health standards and other applicable standards.)
  - (b) All cab glazing shall be safety glazing material. Windows shall be provided in the front and on both sides of the cab or operator's compartment with visibility forward and to either side. Visibility forward shall include a vertical range adequate to cover the boom point at all times. The front window may have a section which can be readily removed or held open, if desired. If the section is of the type held in the open position, it shall be secured to prevent inadvertent closure. A windshield wiper should be provided on the front window.
  - (c)(i) Where necessary for rigging or service requirements, a ladder or steps shall be provided to give access to a cab roof.
  - (ii) On cranes, guardrails, handholds and steps shall be provided for easy access to the car and cab in accordance with chapter 296-155 WAC, Part C-1 and Part J.
  - (iii) Platforms and walkways shall have anti-skid surfaces.
  - (d) Fuel tank filler pipe shall be located in such a position, or protected in such manner, as to not allow spill or overflow to run onto the engine, exhaust, or electrical equipment of any machine being fueled.
  - (i) An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of equipment.
- Note: For additional requirements relating to portable fire extinguishers see WAC 296-800-300.
- (ii) All fuels shall be transported, stored, and handled to meet the rules of Part D of this chapter. When fuel is transported by vehicles on public highways, department of transportation rules concerning such vehicular transportation are considered applicable.
  - (e) Except where electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:
    - (i) For lines rated 50 kV. or below, minimum clearance between the

lines and any part of the crane or load shall be 10 feet;

(ii) For lines rated over 50 kV., minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV. over 50 kV., or twice the length of the line insulator, but never less than 10 feet;

(iii) In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV., and 10 feet for voltages over 50 kV. up to and including 345 kV., and 16 feet for voltages up to and including 750 kV;

(iv) A person shall be designated to observe clearance of the equipment and give timely warning to insure that the required separation is maintained for all operations where it is difficult for the operator to maintain the desired clearance by visual means;

(v) Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation;

(vi) Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded;

(vii) Prior to work near transmitter tower where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be deenergized or tests shall be made to determine if electrical charge is induced on the crane.

(f) The following precautions shall be taken when necessary to dissipate induced voltage:

(i) The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom; and

(ii) Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.

(iii) Combustible and flammable materials shall be removed from the immediate area prior to operations.

(g) No modifications or additions which affect the capacity or safe operation of the equipment shall be made by the employer without the manufacturer's or a qualified engineer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

(h) The employer shall comply with Power Crane and Shovel Association, Mobile Hydraulic Crane Standard No. 2.

(i) Sideboom cranes mounted on wheel or crawler tractors shall meet the requirements of SAE J743a-1964.

(4) Crawler, locomotive, and truck cranes.

(a) All jibs shall have positive stops to prevent their movement of more than 5' above the straight line of the jib and boom on conventional type crane booms. The use of cable type belly slings does not constitute compliance with this standard.

(b) All crawler, truck or locomotive cranes in use shall meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in the ANSI B30.5-1989, Safety Code for Crawler, Locomotive and Truck Cranes.

(5) Tower cranes.

(a) Tower cranes shall be erected, jumped and dismantled under the immediate supervision of a competent person, designated by the employer.

(b) Tower cranes shall be erected, maintained and used in accordance

with the manufacturer's specifications, recommendations and procedures. All modifications shall be approved by the manufacturer and engineered by a professional engineer. The safety factors shall not be reduced by any modifications. The crane plates and charts shall be changed to reflect any modifications made.

(c) A professional engineer shall certify that the crane foundations and underlying soil are adequate support for the tower crane with its maximum overturning movement.

(d) Tower cranes shall be positioned whereby they can swing 360° without either the counterweight or jib striking any building, structure or other object, except:

(i) If the crane can strike an object or another crane, suitable limit switches shall be installed which will prohibit contact with such objects, or;

(ii) Direct voice communications shall be established between any operator of the tower crane(s) involved and a signalperson so stationed where the boom and/or counterweight movement, and the object with which it may contact can be observed so that the operator(s) can be warned of imminent danger.

(iii) A secondary means of positive communications shall be established as a back-up for possible direct voice communication failure.

(iv) Radio communication systems without tone coded squelch are prohibited. Citizens band radios shall not be used as a means of communications for tower cranes.

(e) Prior to installing a climbing tower crane within an existing building or new construction, a structural engineer shall certify that the building is designed to withstand the torque and floor loading created by the crane to be installed.

(f) Tower cranes erected on a new foundation shall be tested in accordance with ANSI B30.3-1990 Chapter 3-1.

(i) The test shall consist of suspending a load of not less than 110% of the rated capacity for 15 minutes. The load shall be suspended from the furthest point of the length of boom (jib) to be used. The results of this test shall be within the manufacturer's recommendations and/or specifications.

(ii) A record of each test shall be made and signed by the person responsible for conducting the test. Such records shall be maintained on the construction site for the duration of the construction work for which it was erected and subsequently made a part of the firm's permanent equipment records. Records shall be made available to authorized representatives of the department, upon request.

(g) A capacity chart shall be furnished by each crane manufacturer which shall include a full and complete range of crane load ratings at all stated operating radii for each allowable speed and each recommended counterweight load.

(i) Such chart shall be posted in the operator's cab or at the remote control stand in use. In lieu of the chart at the remote control stand, a minimum of two weight capacity signs shall be affixed to the jib or boom.

(ii) The chart shall be visible and readable to the operator while at the normal operating position.

(h) Operating controls shall be properly marked to indicate the function of the controls in each position.

(i) An operating and maintenance manual written in the English language shall be provided with each tower crane.

(j) Limit switches shall be installed and shall be kept properly adjusted. They shall be protected or isolated in a manner which will prevent unauthorized tampering. Limit switches shall provide the following functions:

(i) Safely limit the travel of the trolley to prevent it from hitting

the outer end of the jib.

(ii) Limit the upward travel of the load block to prevent two-blocking.

(iii) Lower over travel limiting devices shall be provided for all load hoists where the hook area is not visible to the operator.

(iv) Limit the load being lifted in a manner whereby no more than 110% of the maximum rated load can be lifted or moved.

(k) The crane shall not be used to pull vehicles of any type, remove piling, loosen form work, pull away loads which are attached to the ground or walls, or for any operation other than the proper handling of freely suspended loads.

(l) When the operator may be exposed to the hazard of falling objects, the tower crane cab and/or remote control station shall have adequate overhead protection.

(m) The operator shall be protected from the weather. If enclosed cabs are provided they shall provide clear visibility in all directions and glass shall be approved safety glass or the equivalent.

(n) An approved and safe means shall be provided for access to operator's cab and machinery platform.

(o) When necessary for inspection or maintenance purposes, ladders, walkways with railing or other devices shall be provided.

(p) Each tower crane shall be provided with a slewing brake capable of preventing the jib or boom from rotating in either direction and stopping the rotation of the jib or boom while loaded, when desired. Such brake shall have a holding device which, when set, will hold the jib or boom in a fixed location without additional attention of the operator. When the crane is out of operation, the jib or boom shall be pointed downwind and the slewing brake shall be released so as to permit the jib or boom to weathervane, providing the jib or boom has a clear 360 degree rotation. Where a 360 degree rotation is not provided, the jib or boom shall be pointed downwind from the prevailing wind and the slewing brake set.

(q) Each tower crane shall be provided with a braking system on the trolley capable of stopping and holding the trolley in any desired position while carrying a maximum load. This brake shall be capable of being locked in a fixed location without additional attention of the operator. An automatic brake or device shall be installed which will immediately stop and lock the trolley in position in the event of a breakage of the trolley rope.

(r) All electrical equipment shall be properly grounded and protection shall be provided against lightning.

(s) When the operator is actually operating the crane, the operator shall remain in a stationary position.

(t) All crane brakes shall automatically set in event of power failure. Swing brakes shall also function in this manner or be capable of being set manually.

(u) Climbing jack systems used for raising a tower crane shall be equipped with over-pressure relief valves, direct-reading pressure gauges, and pilot-operated hydraulic check valves installed in a manner which will prevent jack from retracting should a hydraulic line or fitting rupture or fail.

(v) During periods of high winds or weather affecting visibility, i.e., fog, etc., only loads shall be handled that are consistent with good safety practices. Good safety practices shall be mutually agreed upon by the operator and the person in charge of the construction job, with due consideration given to manufacturer's specifications and recommendations.

(w) Counterweights shall be securely fastened in place and shall not exceed the weight as recommended by the manufacturer for the length of jib being used. However, an amount of counterweight as recommended by the manufacturer shall be used.

(x) Tower cranes shall be inspected and maintained in accordance with the manufacturer's recommendations or more frequently if there is reason to

suspect a possible defect or weakening of any portion of the structure or equipment.

(y) Guy wires, wedges, braces or other supports shall be inspected at the beginning and at midpoint of each working shift to ascertain that they are functioning as intended.

(6) Additional tower crane requirements.

(a) An approved method (~~((shall))~~) must be instituted for transmitting signals to the operator. Standard hand signals for crane operations (~~((shall))~~) must be used, whenever possible; however, if conditions are such that hand signals are ineffective, radio-controlled or electric-whistle signal or two-way voice communication (~~((shall))~~) must be used. (See WAC 296-155-525 (~~((4))~~) (5)(d).)

(b) Tower cranes shall not be erected or raised when the wind velocity at the worksite exceeds 20 m.p.h. or that specified by the manufacturer.

(c) Tower crane operators shall be trained and experienced in tower crane operations; however, for gaining experience, persons may operate the tower crane if under the immediate supervision of an experienced operator.

(d) Adequate clearance shall be maintained between moving and rotating structures of the crane and fixed objects to allow the passage of employees without harm.

(e) Employees required to perform duties on the horizontal boom of hammerhead tower cranes shall be protected against falling by guardrails or by a full body harness and lanyards attached to crane or to lifelines in conformance with Part C-1 of this chapter.

(f) Buffers shall be provided at both ends of travel of the trolley.

(g) Cranes mounted on rail tracks shall be equipped with limit switches limiting the travel of the crane on the track and stops or buffers at each end of the tracks.

(h) All hammerhead tower cranes in use shall meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed by the manufacturer.

(i) Access ladders inside the telescoping sections of tower cranes are exempt from those sections of the safety standards pertaining to cleat length and cleat spacing, but shall conform to manufacturer's recommendations and specifications.

(7) Overhead and gantry cranes.

(a) The rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block, and this marking shall be clearly legible from the ground or floor.

(b) Bridge trucks shall be equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.

(c) Except for floor-operated cranes, a gong or other effective audible warning signal shall be provided for each crane equipped with a power traveling mechanism.

(d) All overhead and gantry cranes in use shall meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed in ANSI B30.2.0-1990, Safety Code for Overhead and Gantry Cranes.

(8) Derricks. All derricks in use shall meet the applicable requirements for design, construction, installation, inspection, testing, maintenance, and operation as prescribed in American National Standard Institute B30.6-1990, Safety Code for Derricks.

(9) Floating cranes and derricks.

(a) Mobile cranes mounted on barges.

(i) When a mobile crane is mounted on a barge, the rated load of the crane shall not exceed the original capacity specified by the manufacturer.

(ii) A load rating chart, with clearly legible letters and figures, shall be provided with each crane, and securely fixed at a location easily

visible to the operator.

(iii) When load ratings are reduced to stay within the limits for list of the barge with a crane mounted on it, a new load rating chart shall be provided.

(iv) Mobile cranes on barges shall be positively secured.

(b) Permanently mounted floating cranes and derricks.

(i) When cranes and derricks are permanently installed on a barge, the capacity and limitations of use shall be based on competent design criteria.

(ii) A load rating chart with clearly legible letters and figures shall be provided and securely fixed at a location easily visible to the operator.

(iii) Floating cranes and floating derricks in use shall meet the applicable requirements for design, construction, installation, testing, maintenance, and operation as prescribed by the manufacturer.

(c) Protection of employees working on barges. The employer shall comply with the applicable requirements for protection of employees as specified in WAC 296-155-630.

(10) Mobile cranes and excavation machines.

(a) In all power driven shovel operations the person in charge shall issue instructions necessary to prevent accidents, to detect and correct unsafe acts and dangerous conditions, and to enforce all safety rules and regulations.

The person in charge shall also issue instructions on the proper method of using tools and handling material.

(b) Where the ground is soft or uneven, timbering and planking shall be used to provide firm foundation and distribute the load.

(c) In case of a breakdown, the shovel shall be moved away from the foot of the slope before repairs are made.

(d) All persons shall keep away from the range of the shovel's swing and shall not be permitted to stand back of the shovel or in line with the swing of the dipper during operation or moving of shovel.

(e) Unauthorized persons shall not be allowed on the shovel during operations, and the operator shall not converse with other persons while operating machine.

(f) The shovel dipper shall rest on the ground or on blocking during shut down periods.

(g) Shovels shall be inspected daily and all defects promptly repaired.

(h) All rubber tired mobile cranes shall be equipped with outriggers and sufficient blocking to properly stabilize crane while operating.

(i) Rubber tired mobile cranes shall be equipped with rear view mirrors.

(j) Positive boom stops shall be provided on all mobile cranes of the wheel and crawler type.

(k) Length of a crane boom and amount of counterweight shall not exceed manufacturer's rated capacity for equipment involved; except on isolated cases where permission is granted by the department.

(l) On all cranes where wedge (~~beckets~~) brackets are used as terminal connections, the proper size wedge shall be used.

(m) On all mobile cranes, the hoist and boom drums shall be provided with a positive operated pawl or dog which shall be used in addition to the brake to hold the load and boom when they are suspended. Counterweight operated dogs are prohibited.

(n) Oiling and greasing shall be done under safe conditions with machine at rest, except when motion of machine is necessary.

(o) All steps, running boards, and boom ladder shall be of substantial construction and in good repair at all times.

(p) Operators shall not leave the cab while master clutch is engaged.

(q) Fire extinguishers shall be readily accessible and within reach of operator at all times.

(r) All shovel and crane cabs shall be kept clean and free of excess

oil and grease on floor and machinery. Oily and greasy rags shall be disposed of immediately after use and not allowed to accumulate.

(s) Tools shall not be left on the cab floor. Spare cans of oil or fuel, and spare parts, shall not be stored in cabs, except in approved racks provided for that purpose.

(t) Mats or planking shall be used in moving shovels or cranes over soft or uneven ground.

(u) Cranes or shovels setting on steep grades shall be securely blocked or secured with a tail hold.

(v) Smoking shall be prohibited while fueling or oiling machines.

(w) Gasoline powered motors shall be stopped during refueling.

(x) Handling of movable feed line (bologna) shall be accomplished with insulated hooks and lineman's rubber gloves.

(y) Where cables cross roads they shall be elevated or placed in a trench.

(z) On all power shovels, including back-hoe types, of one-half cubic yard capacity or over, and on all dragline cranes or all-purpose cranes of the crawler or wheel type, two persons shall constitute the minimum working crew. It is mandatory that one be a qualified operator of the equipment in use. The job title of the other crew member may be oiler, rigger, signal person, or a laborer. The primary purpose of the second crew member is to signal the operator when the operator's vision is impaired or obscured and to be on-hand in case of emergency.

(i) Second-crew persons shall be properly trained in their second-person required skills.

(ii) The second crew member shall be close enough to the machine in operation to be aware of any emergency, if one arises, and to assure the machine is operated with necessary and appropriate signals to the operator.

#### AMENDATORY SECTION (Amending Order 94-07, filed 7/20/94, effective 9/20/94)

**WAC 296-155-530 Material hoists, personnel hoists, and elevators.** (1) General requirements.

(a) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where the manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.

(b) The employer shall ensure that no person shall enter a hoistway, elevator shaft, or similar enclosure in which the hoisting apparatus or vehicle is installed and functioning unless the power source operating those systems is locked out in accordance with WAC 296-155-429.

(c) Rated load capacities, recommended operating speeds, and special hazard warning or instructions shall be posted on cars and platforms.

(d) Wire rope shall be removed from service when any of the following conditions exists:

(i) In hoisting ropes, six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay;

(ii) Abrasion, scrubbing, flattening, or peening, causing loss of more than one-third of the original diameter of the outside wires;

(iii) Evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires;

(iv) Reduction from nominal diameter of more than three sixty-fourths inch for diameters up to and including three-fourths inch; one-sixteenth inch

for diameters seven-eighths to 1 1/8 inches; and three thirty-seconds inch for diameters 1 1/4 to 1 1/2 inches.

(e) Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations.

(f) The installation of live booms on hoists is prohibited.

(g) The use of endless belt-type man lifts on construction shall be prohibited.

(h) Employees shall not be permitted to ride on top of material hoists, personnel hoists or permanent elevators except for purposes of inspection, maintenance, elevator installation or dismantling work.

(2) Material hoists, (a)(i) Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. Rules and notices shall be posted on the car frame or crosshead in a conspicuous location, including the statement "No riders allowed."

(ii) No person shall be allowed to ride on material hoists except for the purposes of inspection and maintenance.

(b) All entrances of the hoistways shall be protected by substantial gates or bars which shall guard the full width of the landing entrance. All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow stripes.

(i) Bars shall be not less than 2- by 4-inch wooden bars or the equivalent, located 2 feet from the hoistway line. Bars shall be located not less than 36 inches nor more than 42 inches above the floor.

(ii) Gates or bars protecting the entrances to hoistway shall be quipped with a latching device.

(c) Overhead protective covering of two-inch planking, 3/4-inch plywood or other solid material of equivalent strength shall be provided on the top of every material hoist cage or platform to prevent objects falling on the workers loading or unloading the hoist.

(i) The protective covering on the top of the cage or platform may be made in hinged sections that may be raised when hoisting long material.

(ii) When using a cage or platform for long material, the several pieces of the material shall be securely fastened together and made fast to the cage or platform, so that no part of the load can fall or project beyond the sides of the cage or platform.

(d) The operator's station of a hoisting machine shall be provided with overhead protection equivalent to tight planking not less than 2 inches thick. The support for the overhead protection shall be of equal strength.

(e) Hoist towers may be used with or without an enclosure on all sides. However, whichever alternative is chosen, the following applicable conditions shall be met:

(i) When a hoist tower is enclosed, it shall be enclosed on all sides for its entire height with a screen enclosure of 1/2-inch mesh, No. 18 U.S. gauge wire or equivalent, except for landing access.

(ii) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with 1/2-inch mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading. A 6-foot high enclosure shall be provided on the unused sides of the hoist tower at ground level.

(f) Car arresting devices shall be installed to function in case of rope failure.

(g) All material hoist towers shall be designed by a licensed professional engineer.

(h) All material hoists shall conform to the requirements of ANSI A10.5-1969, Safety Requirements for Material Hoists.

(3) Personnel hoists.

(a) Personnel hoists shall be provided for access and egress on all

multi story buildings where vertical travel exceeds sixty feet from a ground level access point.

(b) Hoist towers outside the structure shall be enclosed for the full height on the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure shall be enclosed to a height of at least 10 feet. Other sides of the tower adjacent to floors or scaffold platforms shall be enclosed to a height of 10 feet above the level of such floors or scaffolds.

(c) Towers inside of structures shall be enclosed on all four sides throughout the full height.

(d) Towers shall be anchored to the structure at intervals not exceeding 25 feet. In addition to tie-ins, a series of guys shall be installed. Where tie-ins are not practical the tower shall be anchored by means of guys made of wire rope at least one-half inch in diameter, securely fastened to anchorages to ensure stability.

(e) Hoistway doors or gates shall be not less than 6 feet 6 inches high and shall be provided with mechanical locks which cannot be operated from the landing side, and shall be accessible only to persons on the car.

(f) Cars shall be permanently enclosed on all sides and the top, except sides used for entrance and exit, which have car gates or doors.

(g) A door or gate shall be provided at each entrance to the car which shall protect the full width and height of the car entrance opening.

(h) Overhead protective covering of 2-inch planking, 3/4-inch plywood or other solid material of equivalent strength shall be provided on the top of every personnel hoist.

(i) Doors or gates shall be provided with electric contacts which do not allow movement of the hoist when door or gate is open.

(j) A signal device shall be installed in the elevator car and only operated by an attendant who shall give the signals for operation, when transporting workers.

(k) An electrical push button signalling device or other approved signalling system shall be provided at each floor landing connected to an annunciator in the car. The signal code shall be posted adjacent to the signal device at each and every work level and at operator's work level. All wording shall be black on a white card, in large clear letters.

(l) The elevator machine and controls shall be housed in as a protection against accidents and the weather, and the door kept locked against unauthorized entrance when operator is not in attendance.

(m) Safeties shall be capable of stopping and holding the car and rated load when traveling at governor tripping speed.

(n) Cars shall be provided with a capacity and data plate secured in a conspicuous place on the car or crosshead.

(o) Internal combustion engines shall not be permitted for direct drive.

(p) Normal and final terminal stopping devices shall be provided.

(q) An emergency stop switch shall be provided in the car and marked "stop."

(r) Ropes:

(i) The minimum number of hoisting ropes used shall be three for traction hoists and two for drum-type hoists.

(ii) The minimum diameter of hoisting and counterweight wire ropes shall be 1/2-inch.

(iii) Safety factors:

MINIMUM FACTORS OF SAFETY  
FOR SUSPENSION WIRE ROPES

Rope speed  
in feet per  
minute:

Minimum  
factor of  
safety

50	7.60
75	7.75
100	7.95
125	8.10
150	8.25
175	8.40
200	8.60
225	8.75
250	8.90
300	9.20
350	9.50
400	9.75
450	10.00
500	10.25
550	10.45
600	10.70

(s) Following assembly and erection of hoists, and before being put in service, an inspection and test of all functions and safety devices shall be made under the supervision of a competent person. A similar inspection and test is required following major alteration of an existing installation. All hoists shall be inspected and tested at not more than 3-month intervals. Records shall be maintained and kept on file for the duration of the job.

(t) All personnel hoists used by employees shall be constructed of materials and components which meet the specifications for materials, construction, safety devices, assembly, and structural integrity as stated in the American National Standard A10.4-1963, Safety Requirements for Workmen's Hoists. The requirements of this subdivision do not apply to cantilever type personnel hoists.

(u) Wire rope shall be taken out of service when any of the following conditions exist:

(i) In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay;

(ii) Wear of one-third the original diameter of outside individual wires. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure;

(iii) Evidence of any heat damage from any cause;

(iv) Reductions from nominal diameter of more than three-sixty-fourths inch for diameters to and including three-fourths inch, one sixteenth inch for diameter seven-eighths inch to 1 1/8 inches inclusive, three-thirty-seconds inch for diameters 1 1/4 to 1 1/2 inches inclusive;

(v) In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

(v)(i) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the

supervision of a qualified engineer competent in this field.

(ii) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with 3/4-inch mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading.

(iii) These hoists shall be inspected and maintained on a weekly basis. Whenever the hoisting equipment is exposed to winds exceeding 35 miles per hour it shall be inspected and put in operable condition before reuse.

(4) ~~((Permanent elevators under the care and custody of the employer and used by employees for work covered by this act shall comply with the requirements of American National Standards Institute, A17.1-1971, and inspected in accordance with A17.2-1960 with addenda A17.2a-1965, A17.2b-1967.))~~ All elevators, manlifts or other lifting devices must be installed and maintained in conformity with the requirements specified in the Washington state elevator laws and regulations adopted by the elevator section of the department of labor and industries.

Note: For additional information refer to chapter 296-100 WAC, safety requirements for material hoists.

#### AMENDATORY SECTION (Amending Order 92-06, filed 10/30/92, effective 12/8/92)

**WAC 296-155-66405 Appendix C--Timber shoring for trenches.** (1) Scope. This appendix contains information that can be used when timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with WAC 296-155-657 (3)(a). Other timber shoring configurations; other systems of support such as hydraulic and pneumatic systems; and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the requirements set forth in WAC 296-155-657 (2) and (3).

(2) Soil classification. In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in appendix A of this part.

(3) Presentation of information. Information is presented in several forms as follows:

(a) Information is presented in tabular form in Tables N-2 through N-7 following subsection (7) of this appendix. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. The data are arranged to allow the user the flexibility to select from among several acceptable configurations of members based on varying the horizontal spacing of the crossbraces. Stable rock is exempt from shoring requirements and therefore, no data are presented for this condition.

(b) Information concerning the basis of the tabular data and the limitations of the data is presented in subsection (4) of this appendix, and on the tables themselves.

(c) Information explaining the use of the tabular data is presented in subsection (5) of this appendix.

(d) Information illustrating the use of the tabular data is presented in subsection (6) of this appendix.

(e) Miscellaneous notations regarding Tables N-2 through N-7 are

presented in subsection (7) of this Appendix.

(4) Basis and limitations of the data.

(a) Dimensions of timber members.

(i) The sizes of the timber members listed in Tables N-2 through N-7 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and on empirical practice.

(ii) The required dimensions of the members listed in Tables N-2, N-3, and N-4 refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are directed to Tables N-5, N-6, and N-7, or have this choice under WAC 296-155-657 (3)(c), and are referred to The Corps of Engineers, The Bureau of Reclamation or data from other acceptable sources.

(b) Limitation of application.

(i) It is not intended that the timber shoring specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be designed as specified in WAC 296-155-657(3).

(ii) When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system designed in accordance with WAC 296-155-657.

(A) When loads imposed by structures or by stored material adjacent to the trench weigh in excess of the load imposed by a two-foot soil surcharge. The term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

(B) When vertical loads imposed on cross braces exceed a 240-pound gravity load distributed on a one-foot section of the center of the crossbrace.

(C) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(D) When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(5) Use of Tables. The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the wales, where wales are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in appendix A of this Part. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed and, in most instances, the selection is also based on the horizontal spacing of the crossbraces. Instances where a choice of horizontal spacing of crossbracing is available, the horizontal spacing of the crossbraces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, and the horizontal spacing of the crossbraces are known, the size and vertical spacing of the crossbraces, the size and vertical spacing of the wales, and the size and horizontal spacing of the uprights can be read from the appropriate table.

(6) Examples to illustrate the use of Tables N-2 through N-4.

(a) Example 1.

A trench dug in Type A soil is 13 feet deep and five feet wide.  
From Table N-2, for acceptable arrangements of timber can be used.

Arrangement #1

Space 4x4 crossbraces at six feet horizontally and four feet vertically.

Wales are not required.

Space 3x8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

Arrangement #2

Space 4x6 crossbraces at eight feet horizontally and four feet vertically.

Space 8x8 wales at four feet vertically.

Space 2x6 uprights at four feet horizontally.

Arrangement #3

Space 6x6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8x10 wales at four feet vertically.

Space 2x6 uprights at five feet horizontally.

Arrangement #4

Space 6x6 crossbraces at 12 feet horizontally and four feet vertically.

Space 10x10 wales at four feet vertically.

Space 3x8 uprights at six feet horizontally.

(b) Example 2.

A trench dug in Type B soil is 13 feet deep and five feet wide.  
From Table N-3 three acceptable arrangements of members are listed.

Arrangement #1

Space 6x6 crossbraces at six feet horizontally and five feet vertically.

Space 8x8 wales at five feet vertically.

Space 2x6 uprights at two feet horizontally.

Arrangement #2

Space 6x8 crossbraces at eight feet horizontally and five feet vertically.

Space 10x10 wales at five feet vertically.

Space 2x6 uprights at two feet horizontally.

Arrangement #3

Space 8x8 crossbraces at 10 feet horizontally and five feet vertically.

Space 10x12 wales at five feet vertically.

Space 2x6 uprights at two feet vertically.

(c) Example 3.

A trench dug Type C soil is 13 feet deep and five feet wide.  
From Table N-4 two acceptable arrangements of members can be used.

Arrangement #1

Space 8x8 crossbraces at six feet horizontally and five feet vertically.

Space 10x12 wales at five feet vertically.

Position 2x6 uprights as closely together as possible.

If water must be retained use special tongue and groove uprights to form tight sheeting.

Arrangement #2

Space 8x10 crossbraces at eight feet horizontally and five feet vertically.

Space 12x12 wales at five feet vertically.

Position 2x6 uprights in a close sheeting configuration unless water pressure must be resisted. Tight sheeting must be used where water must be retained.

(d) Example 4.

A trench dug in Type C soil is 20 feet deep and 11 feet wide. The size and spacing of members for the section of trench that is over 15 feet in depth is determined using Table N-4. Only one arrangement of members is provided.

Space 8x10 crossbraces at six feet horizontally and five feet vertically.

Space 12x12 wales at five feet vertically.

Use 3x6 tight sheeting.

Use of Tables N-5, N-6, and N-7 would follow the same procedures.

(7) Notes for all tables.

(a) Member sizes at spacings other than indicated are to be determined as specified in WAC 296-155-657(3). "Design of Protective Systems."

(b) When conditions are saturated or submerged use Tight Sheeting. Tight Sheeting refers to the use of specially-edged timber planks (e.g., tongue and groove) at least three inches thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water and to prevent the loss of backfill material. Close Sheeting refers to the placement of planks side-by-side allowing as little space as possible between them.

(c) All spacing indicated is measured center to center.

(d) Wales to be installed with greater dimension horizontal.

(e) If the vertical distance from the center of the lowest crossbrace to the bottom of the trench exceeds two and one-half feet, uprights shall be firmly embedded or a mudsill shall be used. Where uprights are embedded, the vertical distance from the center of the lowest crossbrace to the bottom of the trench shall not exceed 36 inches. When mudsills are used, the vertical distance shall not exceed 42 inches. Mudsills are wales that are installed at the toe of the trench side.

(f) Trench jacks may be used in lieu of or in combination with timber crossbraces.

(g) Placement of crossbraces. When the vertical spacing of crossbraces is four feet, place the top crossbrace no more than two feet below the top of the trench. When the vertical spacing of crossbraces is five feet, place the top crossbrace no more than 2.5 feet below the top of the trench.

Place illustration here.

~~((Place illustration here.))~~

Place illustration here.

Place illustration here.

Place illustration here.

Place illustration here.

Place illustration here.

AMENDATORY SECTION (Amending Order 92-06, filed 10/30/92, effective 12/8/92)

**WAC 296-155-66411 Appendix F--Selection of protective systems.** The following figures are a graphic summary of the requirements contained in Part N for excavations 20 feet or less in depth. Protective systems for use in excavations more than 20 feet in depth must be designed by a registered professional engineer in accordance with WAC 296-155-657 (2) and (3).

~~((Place illustration here.))~~

Place illustration here.

Place illustration here.

Place illustration here.

AMENDATORY SECTION (Amending Order 74-26, filed 5/7/74, effective 6/6/74)

**WAC 296-155-960 Protective frame (ROPS) test procedures and performance requirements for wheel-type agricultural and industrial tractors used in construction.** (1) Definitions applicable to this section.

(a) SAE J333a, Operator Protection for Wheel-Type Agricultural and Industrial Tractors (July 1970) defines "agricultural tractor" as a "wheel-type vehicle of more than 20 engine horsepower designed to furnish the power to pull, carry, propel, or drive implements that are designed for agricultural usage." Since this chapter applies only to construction work, the following definition of "agricultural tractor" is adopted for purposes of this part: "Agricultural tractor" means a wheel-type vehicle of more than 20 engine horsepower, used in construction work, which is designed to furnish the power to pull, propel, or drive implements.

(b) "Industrial tractor" means that class of wheeled type tractor of more than 20 engine horsepower (other than rubber-tired loaders and dozers

described in WAC 296-155-955), used in operations such as landscaping, construction services, loading, digging, grounds keeping, and highway maintenance.

(c) The following symbols, terms, and explanations apply to this section:

$E_{is}$  = Energy input to be absorbed during side loading.  $E_{is} = 723 + 0.4 W$  ft.-lb. ( $E'_{is} = 100 + 0.12 W'$ , m.- kg).

$E_{ir}$  = Energy input to be absorbed during rear loading.  $E_{ir} = 0.47 W$  ft.- lb. ( $E'_{ir} = 0.14 W'$ , m.- kg).

$W$  = Tractor weight as prescribed in WAC 296-155-960 (5)(a) and (5)(c) in lb. ( $W'$ , kg).

$L$  = Static load, lb. (kg.).

$D$  = Deflection under  $L$ , in. (mm.).

$L$ - $D$  = Static load-deflection diagram.

$L_m$ - $D_m$  = Modified static load-deflection diagram (Figure V-20). To account for increase in strength due to increase in strain rate, raise  $L$  in plastic range to  $L \times K$ .

$K$  = Increase in yield strength induced by higher rate of loading (1.3 for hot rolled low carbon steel 1010-1030). Low carbon is preferable; however, if higher carbon or other material is used,  $K$  must be determined in the laboratory. Refer to Charles H. Norris, et al., Structural Design for Dynamic Loads (1959), p. 3.

$L_{max}$  = Maximum observed static load.

Load limit = Point on  $L$ - $D$  curve where observed static load is  $0.8 L_{max}$  (refer to Figure V-19).

$E_u$  = Strain energy absorbed by the frame, ft.-lb. (m. - kg) area under  $L_m$ - $D_m$  curve.

FER = Factor of energy ratio,  $FER = E_u/E_{is}$ ; also  $= E_u/E_{ir}$ .

$P_b$  = Maximum observed force in mounting connection under static load,  $L$ , lb. (kg.).

FSB = Design margin for mounting connection  $FSB = (P_u/P_b) - 1$ .

$H$  = Vertical height of lift of 4,410 lb. (2,000 kg.) weight, in. ( $H'$ , mm.). The weight shall be pulled back so that the height of its center of gravity above the point of impact is defined as follows:  $H = 4.92 + 0.00190 W$  or ( $H' = 125 + 0.107 W'$ ) (Figure V-14).

Place illustration here.

**FIGURE V-14**

Impact energy and corresponding lift height of 4,410 lb. (2,000 kg.) weight.

~~((iii))~~ (d) Source of standard. The standard in this section is derived from, and restates, Society of Automotive Engineers Standard J334a (July 1970), Protective Frame Test Procedures and Performance Requirements. This standard ~~((shall))~~ must be ~~((resorted to))~~ used in the event that questions of interpretation arise. The standard appears in the 1971 SAE Handbook.

(2) General.

(a) The purpose of this section is to set forth requirements for frames for the protection of operators of wheel type agricultural and industrial tractors to minimize the possibility of operator injury resulting from accidental upsets during normal operation. With respect to agricultural and industrial tractors, the provisions of WAC 296-155-955 and 296-155-965 for rubber-tired dozers and rubber-tired loaders may be utilized in lieu of the requirements of this section.

(b) The protective frame which is the subject of this standard is a structure mounted to the tractor that extends above the operator's seat and conforms generally to Figure V-15.

Place illustration here.

**FIGURE V-15**

Typical frame configuration.

(c) If an overhead weather shield is attached to the protective frame, it may be in place during tests: Provided, That it does not contribute to the strength of the protective frame. If such an overhead weather shield is

attached, it must meet the requirements of subsection (10) of this section.

(d) For overhead protection requirements, see WAC 296-155-965.

(e) If protective enclosures are used on wheel-type agricultural and industrial tractors, they shall meet the requirements of Society of Automotive Engineers Standard J168 (July 1970), Protective Enclosures, Test Procedures, and performance requirements.

(3) Applicability. The requirements of this section apply to wheel-type agricultural tractors use in construction work and to wheel-type industrial tractors used in construction work. See subsection (1) of this section for definitions of agricultural tractors and industrial tractors.

(4) Performance requirements.

(a) Either a laboratory test or a field test is required in order to determine the performance requirements set forth in subsection (10) of this section.

(b) A laboratory test may be either static or dynamic. The laboratory test must be under conditions of repeatable and controlled loading in order to permit analysis of the protective frame.

(c) A field upset test, if used, shall be conducted under reasonably controlled conditions, both rearward and sideways, to verify the effectiveness of the protective frame under actual dynamic conditions.

(5) Test procedure--General.

(a) The tractor used shall be the tractor with the greatest weight on which the protective frame is to be used.

(b) A new protective frame and mounting connections of the same design shall be used for each test procedure.

(c) Instantaneous and permanent frame deformation shall be measured and recorded for each segment of the test.

(d) Dimensions relative to the seat shall be determined with the seat unloaded and adjusted to its highest and most rearward latched position provided for a seated operator.

(e) If the seat is offset, the frame loading shall be on the side with the least space between the centerline of the seat and the upright.

(f) The low temperature impact strength of the material used in the protective structure shall be verified by suitable material tests or material certifications in accordance with WAC 296-155-955 (7)(b)(iv).

(6) Test procedure for vehicle overturn.

(a) Vehicle weight. The weight of the tractor, for purposes of this section, includes the protective frame, all fuels, and other components required for normal use of the tractor. Ballast must be added if necessary to achieve a minimum total weight of 130 lb. (59 kg.) per maximum power takeoff horsepower at rated engine speed. The weight of the front end must be at least 33 lb. (15 kg.) per maximum power takeoff horsepower. In case power takeoff horsepower is unavailable, 95 percent of net engine flywheel horsepower shall be used.

(b) Agricultural tractors shall be tested at the weight set forth in subdivision (a) of this subsection.

(c) Industrial tractors shall be tested with items of integral or mounted equipment and ballast that are sold as standard equipment or approved by the vehicle manufacturer for use with the vehicle where the protective frame is expected to provide protection for the operator with such equipment installed. The total vehicle weight and front end weight as tested shall not be less than the weights established in subdivision (a) of this subsection.

(d) The test shall be conducted on a dry, firm soil bank as illustrated in Figure V-16. The soil in the impact area shall have an average cone index in the 0.6 in. (153 mm.) layer not less than 150 according to American Society of Agricultural Engineers Recommendations ASAE R313, Soil Cone Penetrometer. The path of travel of the vehicle shall be  $12\frac{1}{2} \pm 2\frac{1}{2}$  to the top edge of the bank.

(e) The upper edge of the bank shall be equipped with an 18 in. (457

mm.) high ramp as described in Figure V-16 to assist in tipping the vehicle.

(f) The front and rear wheel tread settings, where adjustable, shall be at the position nearest to halfway between the minimum and maximum settings obtainable on the vehicle. Where only two settings are obtainable, the minimum setting shall be used.

(g) Vehicle overturn test--Sideways and rearward.

(i) The tractor shall be driven under its own power along the specified path of travel at a minimum speed of 10 m.p.h. (16 km./hr.) or maximum vehicle speed if under 10 m.p.h. (16 km./hr.) up the ramp as described in subdivision (e) of this subsection to induce sideways overturn.

(ii) Rear upset shall be induced by engine power with the tractor operating in gear to obtain 3-5 m.p.h. (4.8-8 km./hr.) at maximum governed engine r.p.m. preferably by driving forward directly up a minimum slope of two vertical to one horizontal. The engine clutch may be used to aid in inducing the upset.

Place illustration here.

#### FIGURE V-16

(7) Other test procedures. When the field upset test is not used to determine ROPS performance, either the static test or the dynamic test, contained in subsection (8) or (9) of this section, shall be made.

(8) Static test.

(a) Test conditions.

(i) The laboratory mounting base shall include that part of the tractor chassis to which the protective frame is attached including the mounting parts.

(ii) The protective frame shall be instrumented with the necessary equipment to obtain the required load deflection data at the locations and directions specified in Figures V-17, V-18, and V-19.

Place illustration here.

**FIGURE V-17**  
Side load application

Place illustration here.

**FIGURE V-18**  
Rear load application.

Place illustration here.

**FIGURE V-19**

Method of measuring instantaneous deflection.

(iii) The protective frame and mounting connections shall be instrumented with the necessary recording equipment to obtain the required load-deflection data to be used in calculating FSB (see subsection (1)(c) of this section). The gauges shall be placed on mounting connections before the installation load is applied.

(b) Test procedure.

(i) The side load application shall be at the upper extremity of the frame upright at a 90° angle to the centerline of the vehicle. The side load "L" shall be applied according to Figure V-17. "L" and "D" shall be recorded simultaneously. The test shall be stopped when:

(a) The strain energy absorbed by the frame is equal to the required input energy( $E_{is}$ ) or

(b) Deflection of the frame exceeds the allowable deflection, or

(c) The frame load limit occurs before the allowable deflection is reached in the side load.

(ii) The L-D diagram, as shown by means of a typical example in Figure V-20, shall be constructed, using the data obtained in accordance with item (i) of this subdivision.

(iii) The modified  $L_m$ - $D_m$  diagram shall be constructed according to item (ii) of this subdivision and according to Figure V-21. The strain energy absorbed by the frame( $E_u$ ) shall then be determined.

(iv)  $E_{is}$ , FER and FSB shall be calculated.

Place illustration here.

**FIGURE V-20**  
Typical L-D diagram.

Place illustration here.

**FIGURE V-21**  
Typical modified  $L_m$ - $D_m$  diagram.

(v) The test procedure shall be repeated on the same frame utilizing L (rear input; see Figure V-19) and  $E_{ir}$ . Rear load application shall be uniformly distributed along a maximum projected dimension of 27 in. (686 mm.) and a maximum area of 160 sq. in. (1,032 sq. cm.) normal to the direction of load application. The load shall be applied to the upper extremity of the frame at the point which is midway between the centerline of the seat and the inside of the frame upright.

(9) Dynamic test.

(a) Test conditions.

(i) The protective frame and tractor shall meet the requirements of subsection (6)(b) or (c) of this section, as appropriate.

(ii) The dynamic loading shall be produced by use of a 4,410 lb. (2,000 kg.) weight acting as a pendulum. The impact face of the weight shall be 27 plus or minus 1 in. by 27 plus or minus 1 in. (686 + or - 25 mm.) and shall be constructed so that its center of gravity is within 1 in. (25.4 mm.) of its geometric center. The weight shall be suspended from a pivot point 18-22 ft. (5.5-6.7 m.) above the point of impact on the frame and shall be conveniently and safely adjustable for height. (See Figure V-22.)

Place illustration here.

**FIGURE V-22**  
Pendulum.

(iii) For each phase of testing, the tractor shall be restrained from moving when the dynamic load is applied. The restraining members shall be of 0.5-0.63 in. (12.5-16 mm.) steel cable and points of attaching restraining members shall be located an appropriate distance behind the rear axle and in front of the front axle to provide a 15°-30° angle between a restraining cable and the horizontal. The restraining member shall either be in the plane in which the center gravity of the pendulum will swing or more than one restraining cable shall give a resultant force in this plane. (See Figure V-23.)

Place illustration here.

**FIGURE V-23**

Method of impact from rear.

(iv) The wheel tread setting shall comply with the requirements of subsection (6)(f) of this section. The tires shall have no liquid ballast and shall be inflated to the maximum operating pressure recommended by the tire manufacturer. With specified tire inflation, the restraining cables shall be tightened to provide tire deflection of 6-8 percent of nominal tire section width. After the vehicle is properly restrained, a wooden beam 6 x 6 in. (15 x 15 cm.) shall be driven tightly against the appropriate wheels and clamped. For the test to the side, an additional wooden beam shall be placed as a prop against the wheel nearest the operator's station and shall be secured to the floor so that it is held tightly against the wheel rim during impact. The length of this beam shall be chosen so that when it is positioned against the wheel rim it is at an angle of 25°-40° to the horizontal. It shall have a length 20-25 times its depth and a width two to three times its depth. (See Figures V-23 and V-24.)

Place illustration here.

**FIGURE V-24**

Method of impact from side.

(v) Means shall be provided indicating the maximum instantaneous deflection along the line of impact. A simple friction device is illustrated in Figure V-24.

(vi) No repair or adjustments may be carried out during the test.

(vii) If any cables, props, or blocking shift or break during the test, the test shall be repeated.

(b) Test procedure.

(i) General. The frame shall be evaluated by imposing dynamic loading to rear followed by a load to the side on the same frame. The pendulum dropped from the height (see definition "H" in subsection (1)(c) of this section) imposes the dynamic load. The position of the pendulum shall be so selected that the initial point of impact on the frame shall be in line with the arc of travel of the center of gravity of the pendulum. A quick release mechanism should be used but, if used, shall not influence the attitude of the block.

(ii) Impact at rear. The tractor shall be properly restrained according to subdivisions (a)(iii) and (iv) of this section. The tractor shall be positioned with respect to the pivot point of the pendulum such that the pendulum is 20° from the vertical prior to impact, as shown in Figure V-23. The impact shall be applied to the upper extremity of the frame at the point which is midway between the centerline of the seat and the inside of the frame upright of a new frame.

(iii) Impact at side. The block and restraining shall conform to subdivisions (a)(iii) and (iv) of this subsection. The point of impact shall be that structural member of the protective frame likely to hit the ground first in a sideways accidental upset. The side impact shall be applied to the side opposite that used for rear impact.

(10) Performance requirements.

(a) General.

(i) The frame, overhead weather shield, fenders, or other parts in the operator area may be deformed but shall not shatter or leave sharp edges exposed to the operator, or violate dimensions as shown in Figures V-17 and V-18 as follows:

D = 2 in. (51 mm.) inside of frame upright to  
vertical centerline of seat.

E = 30 in. (762 mm.).

F = Not less than 0 in. and not more than 12  
in. (305 mm.), measured at centerline  
front of seat backrest to crossbar along  
the line of load application as shown in  
Figure V-17.

G = 24 in. (610 mm.).

(ii) The material and design combination used in the protective structure must be such that the structure can meet all prescribed performance tests at zero degrees Fahrenheit in accordance with WAC 296-155-955 (7)(b)(iv).

(b) Vehicle overturn performance requirements. The requirements of this subsection (10) must be met in both side and rear overturns.

(c) Static test performance requirements. Design factors shall be incorporated in each design to withstand an overturn test as prescribed in this subsection (10). The structural requirements will be generally met if FER is greater than 1 and FSB is greater than K-1 in both side and rear loadings.

(d) Dynamic test performance requirements. Design factors shall be incorporated in each design to withstand the overturn test prescribed in this subsection (10). The structural requirements will be generally met if the dimensions in this subsection (10) are adhered to in both side and rear loads.

AMENDATORY SECTION (Amending WSR 99-05-080, filed 2/17/99, effective 6/1/99)

**WAC 296-305-04001 Respiratory equipment protection.** (1) Fire fighter's self-contained breathing apparatus (SCBA) shall:

- (a) Be pressure demand type (positive pressure);
- (b) Operate in the positive pressure mode only;
- (c) Have a minimum of thirty minutes service duration;
- (d) Be NIOSH certified; and
- (e) Meet the requirements of the 1992 or 1997 edition of NFPA, Standard on Open Circuit Self Contained Breathing Apparatus for Fire Fighters 1981.

(2) Closed circuit SCBA shall:

- (a) Be positive pressure;
- (b) Be NIOSH certified; and
- (c) Have a minimum thirty-minute service duration.

(3) Members using SCBA's shall operate in teams of two or more.

(4) Except as otherwise provided in this chapter, fire departments shall adopt, maintain and implement a written respiratory protection program that addresses the requirements of chapter 296-62 WAC, Part E, Respiratory protection and Part I-1, Asbestos, Tremolite, Anthophyllite, and Actinolite. This includes program administration, medical limitations, equipment limitations, equipment selection, inspection, use, maintenance, training, fit testing procedures, air quality, and program evaluation.

Note: Additional information on respirators and respirator usage can be found in ANSI Z88.2 - American National Standard for Respiratory Protection; ANSI Z88.5 - Practices for Respiratory Protection for Fire Service; various NFPA publications (1981, 1404, 1500, etc.), and the Washington State Fire Service Training Program for respiratory training and usage.

(5) When fire departments purchase compressed breathing air from a vendor, the fire department shall require the vendor to provide certification and documentation of breathing air quality as specified in subsection (21) of this section and in chapter 296-62 WAC, Part E.

(6) When the fire department makes its own breathing air or uses vendor purchased breathing air, the air quality from compressors, cascade systems cylinders, shall be tested at least quarterly as specified in subsection (21) of this section.

(7) Fit testing shall be conducted in accordance with this section and chapter 296-62 WAC, Part E, Respiratory protection.

(a) Each new member shall be tested before being permitted to use SCBA's in a hazardous atmosphere.

(b) Only fire fighters with a properly fitting facepiece shall be permitted by the fire department to function in a hazardous atmosphere with SCBA. (Reference WAC ((~~296-62-07115(3)~~)) 296-62-07170 Respiratory Sealing Problems.)

(c) Fit testing shall be repeated:

(i) At least once every twelve months.

(ii) Whenever there are changes in the type of SCBA or facepiece used.

(iii) Whenever there are significant physical changes in the user.

Example: Weight change of ten percent or more, scarring of face seal area, dental changes, cosmetic surgery, or any other condition that may affect the fit of the facepiece seal.

(d) The fit testing is done only in a negative-pressure mode. If the facepiece is modified for fit testing, the modification shall not affect the normal fit of the device. Such modified devices shall only be used for fit testing.

(e) The fit test procedures and test exercises described in WAC ((~~296-62-07739~~)) 296-62-07162, Asbestos, Appendix C, shall be followed unless stated otherwise in this chapter.

(f) Respirator fit test records shall include:

(i) Written guidelines for the respirator fit testing program including pass/fail criteria;

(ii) Type of respirator tested including manufacturer, model, and size;

(iii) Type of fit test and instrumentation or equipment used;

(iv) Name or identification of test operator;

(v) Name of person tested;

(vi) Date of test; and

(vii) Results of test.

Note: Fire fighters should be issued individual facepieces.

(8) Facial hair, contact lenses, and eye and face protective devices.

(a) A negative pressure respirator, any self-contained breathing apparatus, or any respirator which is used in an atmosphere immediately dangerous to life or health (IDLH) equipped with a facepiece shall not be worn if facial hair comes between the sealing periphery of the facepiece and the face or if facial hair interferes with the valve function.

(b) The wearer of a respirator shall not be allowed to wear contact lenses if the risk of eye damage is increased by their use.

(c) If a spectacle, goggle, or face shield must be worn with a facepiece, it shall be worn so as to not adversely affect the seal of the facepiece to the face. See WAC ((~~296-62-07115(3)~~)) 296-62-07170(2).

(d) Straps or temple bars shall not pass between the seal or surface of the respirator and the user's face.

(9) At the end of suppression activities (to include fire overhaul) and before returning to quarters:

(a) Fire fighters shall be decontaminated prior to removal of respirators whenever fire fighting activities resulted in exposure to a hazardous substance.

(b) When exchanging air supply bottles during suppression or overhaul activities, reasonable precautions shall be taken to maintain uncontaminated atmosphere to the breathing zone and facepiece supply hose.

(10) Self-contained respiratory equipment shall be available and used by all fire fighters who enter into hazardous atmospheres during structural fire fighting activities.

(11) Positive pressure air line respirators may be used only for atmospheres other than IDLH and must be equipped with a five minute minimum capacity positive pressure escape bottle.

(a) If the service life of the auxiliary air supply is fifteen minutes or less it shall not be used for entry into an IDLH atmosphere but it may be used for escape purposes. The auxiliary air supply may be used for entry into an IDLH atmosphere only when the service life of the unit exceeds fifteen minutes and when not more than twenty percent of the noted air supply will be used during entry.

(b) The maximum length of hose for supplied air respirators is 300 feet (91 meters). Such hose shall be heavy duty nonkinking and NIOSH approved.

(12) Respirators shall be provided for, and shall be used by, all personnel working in areas where:

(a) The atmosphere is hazardous;

(b) The atmosphere is suspected of being hazardous; or

(c) The atmosphere may rapidly become hazardous;

(13) Anytime fire fighters are working inside a confined space, such persons shall be provided with SCBA or air line respirator with escape bottle, and shall use the equipment unless the safety of the atmosphere can be established by testing and continuous monitoring.

(14) Fire fighters using a properly functioning SCBA shall not compromise the protective integrity of the SCBA by removing the facepiece for any reason in hazardous atmospheres or in atmospheres where the quality of air is unknown.

(15) Fire fighters shall receive training for each type and manufacturer of respiratory equipment available for their use, the step-by-step procedure for donning the respirator and checking it for proper function. Required training shall include:

- (a) Recognizing hazards that may be encountered;
- (b) Understanding the components of the respirator;
- (c) Understanding the safety features and limitations of the respirator; and
- (d) Donning and doffing the respirator.

(16) After completing such training, each fire fighter shall practice at least quarterly, for each type and manufacture of respirator available for use, the step-by-step procedure for donning the respirator and checking it for proper function.

(17) Members shall be tested at least annually on the knowledge of respiratory protection equipment operation, safety, organizational policies and procedures, and facepiece seals, to the fire department's standard. Such records shall remain part of the member training file.

(18) Members shall be allowed to use only the make, model, and size respirator for which they have passed a fit test within the last twelve months.

(19) In cases where there is a reported failure of a respirator, it shall be removed from service, tagged and recorded as such, and tested before being returned to service.

(20) Fire fighters shall be thoroughly trained in accordance with the manufacturer's instructions on emergency procedures such as use of regulator bypass valve, corrective action for facepiece and breathing tube damage, and breathing directly from the regulator (where applicable).

(21) Compressed gaseous breathing air in the SCBA cylinder shall meet the requirements of ANSI/CGA G7.1 - Commodity Specification for Air, with a minimum air quality of grade D, as well as meeting a water vapor level of 24 ppm or less.

(22) SCBA cylinders shall be hydrostatically tested within the periods specified by the manufacturer and the applicable governmental agencies.

Additional reference: Chapter 296-62 WAC, Part E.

AMENDATORY SECTION (Amending WSR 96-11-067, filed 5/10/96, effective 1/1/97)

**WAC 296-305-05003 Confined space rescue operations.** (1) Fire departments shall comply with chapter 296-62 WAC, Part M for their own confined spaces.

(2) Fire departments which have been contracted as an outside rescue service provider shall also comply with Part M and in particular the specific provisions of WAC ((~~296-62-14519(1)~~)) 296-62-14150(2) which requires authorized entrant training and rescue practices from the host's actual permit spaces or representative permit spaces.

(3) Fire departments which have responded or will respond to calls to perform rescue from a noncontracted permit-required confined space are required to have each member of a rescue team practice making permit space rescues at least every 12 months by means of simulated rescue operations in which they remove dummies, mannequins or actual persons from permit space. A

permit is required for the practice permit space entry.

(4) During an actual rescue response, written and/or verbally recorded hazard sizeup will be allowed in lieu of the written permit requirements in WAC 296-62-14507 and 296-62-14509 and shall be completed prior to any entry. This sizeup shall include at a minimum:

(a) Recognition and declaration of the situation as a confined space incident.

(b) Denial of entry to unprotected persons.

(c) Assessment of all readily available confined space documentation, e.g., MSDSs, any existing permit, plans or blueprints of the space.

(d) Assessment of number of victim(s), locations and injury conditions.

(e) Discussion with witnesses, supervisor, etc.

(f) Assessment of any current or potential space hazards, in particular, any hazard(s) which lead to the necessary rescue.

(g) Determination and declaration if body recovery or victim rescue.

(5) At confined space incidents, at least two people outside shall be equipped with appropriate breathing apparatus to act as the back-up team, which shall remain free of the contaminated area in order to rescue disabled fire fighters.

(6) Written documentation of the rescue team's training on the fire department's confined space operating procedures, authorized entrant training, if applicable, the contracted host's confined space program. A record of each of the hazard sizeups shall be maintained for at least one year.

AMENDATORY SECTION (Amending WSR 01-17-033, filed 8/8/01, effective 9/1/01)

**WAC 296-307-039 First-aid rule summary.** Your responsibility: Make sure first-aid trained personnel are available to provide quick and effective first aid.

You must:

Make sure that first-aid trained personnel are available to provide quick and effective first aid.

WAC ((~~246-307-03905~~)) 296-307-03905.

Make sure first-aid training contains required subjects.

WAC 296-307-03910.

Keep current and document your first-aid training.

WAC 296-307-03915.

Make sure appropriate first-aid supplies are readily available.

WAC 296-307-03920.

Provide a first-aid station when required.

WAC 296-307-03925.

Note: Additional requirements relating to first-aid are also located in the following sections:

- WAC 296-307-07013(12), What rules apply to vehicles used to transport employees?
- WAC 296-307-16175, First-aid requirements for operators of temporary worker housing.
- WAC 296-307-16380, First-aid requirements for operators of cherry harvest camps.

Definitions:

**First aid:** The extent of treatment you would expect from a person trained in basic first aid, using supplies from a first-aid kit.

**Emergency medical service:** Medical treatment and care given at the scene of any medical emergency or while transporting any victim to a medical facility.

You can get copies of these rules by calling 1-800-4BE SAFE (1-800-423-7233), or by going to <http://www.lni.wa.gov>.

AMENDATORY SECTION (Amending WSR 98-24-096, filed 12/1/98, effective 3/1/99)

**WAC 296-307-08009 What requirements apply to the testing and performance of ROPS used on agricultural tractors?** You must provide a rollover protective structure (ROPS) for each employee-operated tractor that is covered by WAC 296-307-080. ROPS used on wheel-type tractors must meet the test and performance requirements of OSHA 1928.((~~52~~))51 CFR((~~7~~)). Protective frames for wheel type agricultural tractors, and ROPS used on track-type tractors must meet the test and performance requirements of SAE Standard J334a (July 1970) and the portions of SAE Standard J167 (1971) pertaining to overhead protection requirements.